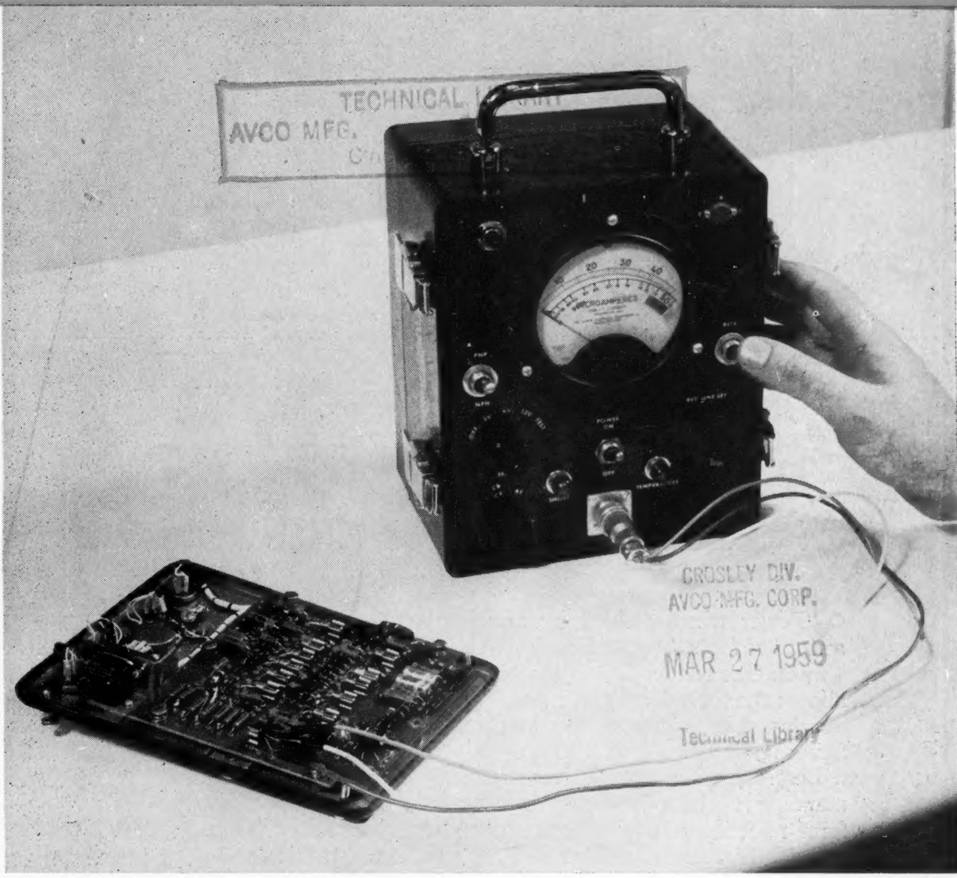
COMPUTERS and AUTOMATION

ATA PROCESSING • CYBERNETICS • ROBOTS

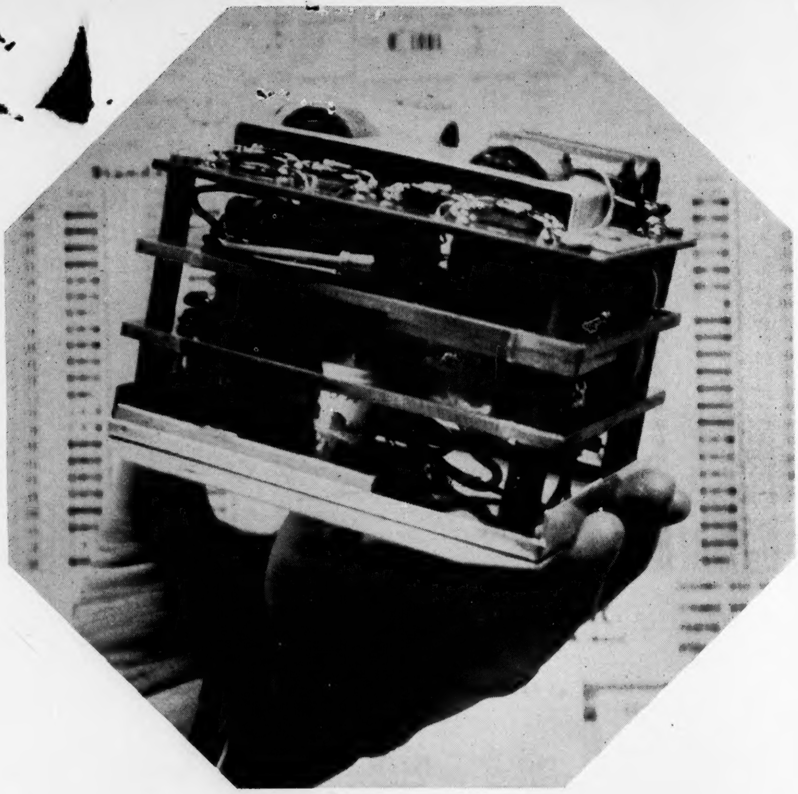


MARCH
1959
•
VOL. 8 - NO. 3

Producing Magnetic Memory Cores

Make Your Tabulating Department a Service Department

A Survey of British Digital Computers



The most serious of facts

● "Power when wielded by abnormal energy is the most serious of facts," wrote Henry Adams in *The Dynamo and the Virgin.* One serious fact is the birth of the handful of power above: the early form of a transistor regulated power supply, developed by *tech/ops,* now in production, in sophisticated forms by *tech/ops'* subsidiary, Power Sources, Incorporated.

Best suited for arduous requirements in applications demanding reliability under extreme operating conditions which force rejection of conventional power supply circuitry (such as guided missiles and other military space needs), this handful of power is also presently being used in television stations, as in a host of other applications.

And it is another typical example of *tech/ops'* product capability and broad scientific research and development for business, industry, and government.

personnel requirements

at **Fort Monroe, Virginia, or Burlington, Massachusetts:** Operations Analysts experienced in industrial or military operations research, systems analysis, weapons systems evaluation, computer techniques, or related fields; training should be in mathematics or physical sciences, preferably on graduate level.
at **Washington, D. C.:** Programmers with substantial experience in the development of large digital computer programs; background should include experience with design and application of assembly programs, compilers, and advanced programming concepts.
at **Monterey, California:** Communications engineer or physicist thoroughly familiar with the principles of radio transmission and communications network analysis.

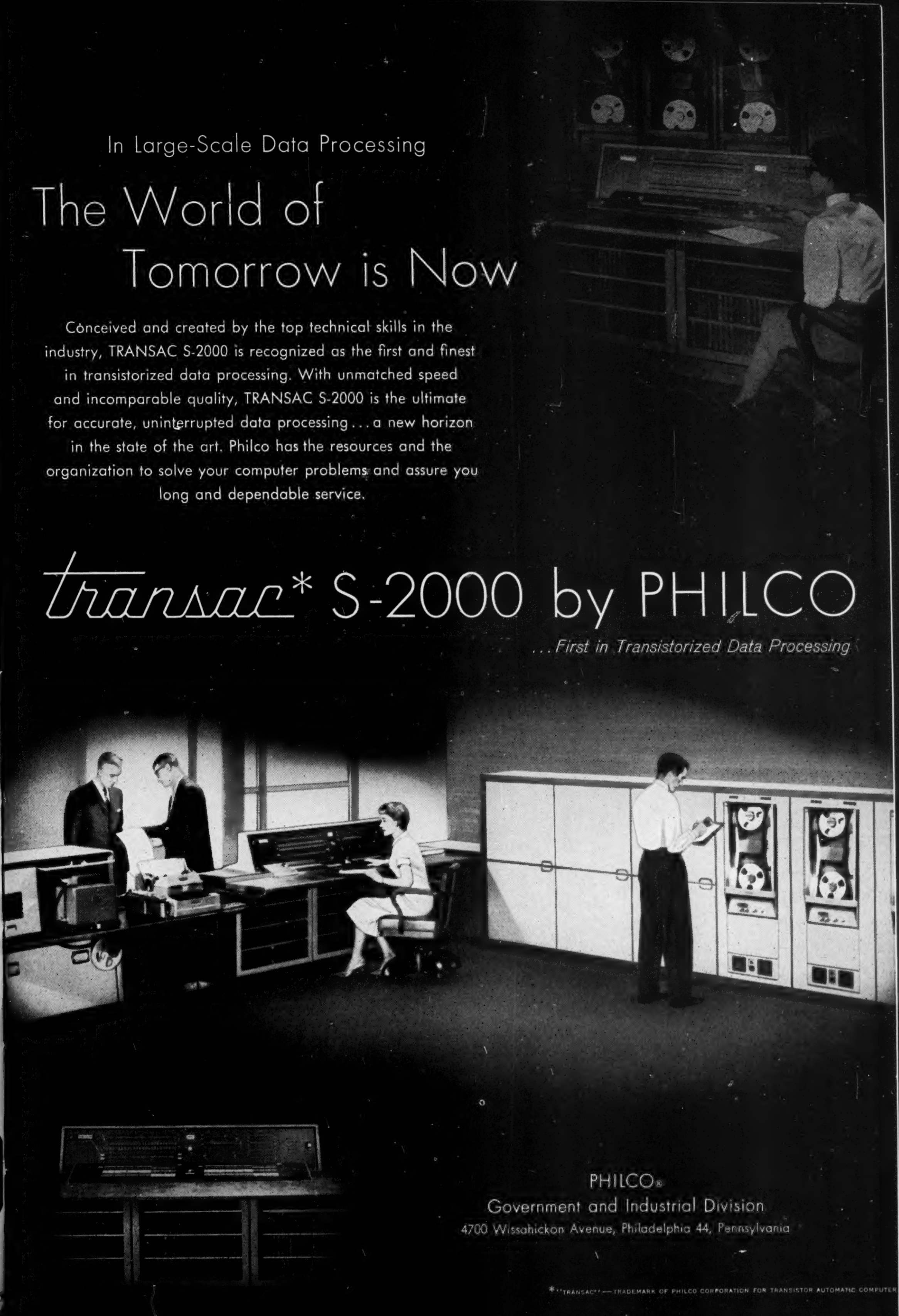
address: Robert L. Koller

Technical Operations, Incorporated

Central Research Laboratories / Burlington, Massachusetts

• WASHINGTON, D.C. • MONTEREY, CALIFORNIA • FORT MONROE, VIRGINIA

tech/ops


In Large-Scale Data Processing
The World of Tomorrow is Now
Conceived and created by the top technical skills in the industry, TRANSAC S-2000 is recognized as the first and finest in transistorized data processing. With unmatched speed and incomparable quality, TRANSAC S-2000 is the ultimate for accurate, uninterrupted data processing . . . a new horizon in the state of the art. Philco has the resources and the organization to solve your computer problems and assure you long and dependable service.
transac* S-2000 by PHILCO
. . . First in Transistorized Data Processing
PHILCO®
Government and Industrial Division
4700 Wissahickon Avenue, Philadelphia 44, Pennsylvania
*"TRANSAC"—TRADEMARK OF PHILCO CORPORATION FOR TRANSISTOR AUTOMATIC COMPUTER

COMPUTERS

and AUTOMATION

DATA PROCESSING • CYBERNETICS • ROBOTS

Volume 8
Number 3

MARCH, 1959

Established
September 1951

COMPUTERS and AUTOMATION is published monthly at 815 Washington St., Newtonville 60, Mass., by Berkeley Enterprises, Inc. Printed in U.S.A.

SUBSCRIPTION RATES: (United States) $5.50 for 1 year, $10.50 for 2 years; (Canada) $6.00 for 1 year, $11.50 for 2 years; (Foreign) $6.50 for 1 year, $12.50 for 2 years.

Address all Editorial and Subscription Mail to Berkeley Enterprises, Inc., 815 Washington St., Newtonville 60, Mass.

ENTERED AS SECOND CLASS MATTER at the Post Office at Boston, Mass.

POSTMASTER: Please send all Forms 3579 to Berkeley Enterprises, Inc., 815 Washington St., Newtonville 60, Mass.

CHANGE OF ADDRESS: If your address changes, please send us both your new address and your old address (as it appears on the magazine address imprint), and allow three weeks for the change to be made.

NOVEL APPLICATIONS OF COMPUTERS

FRONT COVER

ARTICLES

READERS' AND EDITOR'S FORUM

REFERENCE INFORMATION

INDEX OF NOTICES

Readers' and Editor's Forum

FRONT COVER: AN IN-CIRCUIT TRANSISTOR TESTER

The front cover shows a testing apparatus which is able to test transistors mounted and connected in their circuits. This is believed to be the first transistor tester able to check the performance of transistors while they are connected in their circuits and without turning power on in the equipment. The tester is now being produced by Philco Corp., Philadelphia; a contract to build more than 900 of these transistor testers has been awarded to Philco by the U.S. Navy Bureau of Ships.

This tester is able to distinguish between normal input and output signals generated by the transistor being checked, and spurious input and output signals arising from "sneak" paths provided by the circuits surrounding the transistor being checked. To nullify the effects of the external circuits, low impedance methods are used in the tester.

ASSOCIATION FOR COMPUTING MACHINERY MEETING, SEPT. 1 TO 3, 1959 — CALL FOR CONTRIBUTED PAPERS

The next Annual Meeting of the Association for Computing Machinery will be held at Mass. Inst. of Technology, Cambridge, Massachusetts, Tuesday September 1 to Thursday September 3, 1959.

Contributed papers concerned with all phases of analog and digital computers and computation are invited. Each person wishing to have a paper considered for the contributed program is requested to submit to the Program Committee by May 4, 1959, four copies of a 100 word abstract, and four copies of a summary of the paper. The amount of time which can be allotted to each contributed paper is limited to 15 minutes, followed by 5 minutes for discussion. The abstract should be suitable for inclusion in the printed program of the meeting. The summary should be of sufficient length to permit evaluation of the paper by the Program Committee but less than four typewritten pages is suggested. One copy of the summary should be typed in black ink on white paper to permit photographic reproduction for inclusion in the Preprints. Preprints will be distributed to all registrants, and offered for sale by the Association for three months after the meeting. Authors who do not wish their summaries to appear in the Preprints should say so.

Abstracts and summaries should be sent to:

J. H. Wegstein, Chairman
ACM Program Committee
National Bureau of Standards
Washington 25, D.C.

Papers for the program will be selected by the Program Committee after May 4, 1959. It will not be possible to consider those papers whose summaries are not in quadruplicate, nor those papers which arrive after the deadline.

REACHING OUT BY SCIENTISTS INTO OTHER FIELDS

I. From Carmon C. Basore
Cabazon, Calif.

To the Editor:

Your magazine has raised the question of the social and moral responsibilities of scientists in regard to the effect of their inventions upon society, whether the effect be good or bad. To me, this is a timely question. Perhaps your editors are among the first to realize its increasing importance, for I believe that the first rate scientists of this country are already assuming social responsibility in regard to those effects of their work that extend into international affairs.

I claim that, in the scientific world we now live in, the implements of war that have been developed are capable of destroying the whole of mankind — and that any scientist, viewing his own work, cannot escape some responsibility, in his own mind, to see that this does not happen.

I cannot accept such a point of view as that expressed by one editor, in your poll of technical magazines, who states:

> "We do believe that any scientific development can be used in a good or bad manner; and it follows from this that the scientist's responsibility in evaluating this is not so much greater than the average citizen's. Such questions are philosophical and should be aired by philosophers, but finally determined by the citizenry."

For me this view means that all we scientists can do is duck our heads and take what comes, and nothing can be done about it. But of course this is not true.

The leading scientists of our country, whose study of science has greatly broadened their minds, have mastered their own field of endeavor and are then able to look about them, understand other fields, and relate their work with other aspects of society.

The capacity of an able scientist to relate his work to other fields has been illustrated in the recent past, as with the quantum theory, when the theoretical developments of science have led into philosophical concepts that traditional philosophy was unable to cope with. To meet this situation the scientist had to take over the job of philosopher and had to provide a philosophic interpretation that would allow him to proceed.

This caused strong objections from some professional philosophers who felt that the scientist was incapable of entering another field of knowledge with any success. Of course the real obstacle probably was the fact that philosophers were not able to keep abreast of the advances of science and were not able to develop the

[Please turn to page 30]

To Senior Computer Programmers interested in

Research and Development
on advanced
Programming Techniques

Those interested in performing research and development on advanced programming techniques will find full scope for their ability at System Development Corporation in Santa Monica, California. SDC's projects are concerned primarily with developing large-scale, computer-centered systems in a number of fields. The application of advanced digital computer techniques is particularly important in these systems.

As these systems are computer-based, programming is an essential function at SDC. *Programming is not a service activity at SDC.*

A few positions are open for senior Computer Programmers. The positions call for strong experience and ability in programming and keen interest in:

Mechanical and programmed techniques of retrieval—Logical design of computers from a Programmer's point of view—Pattern recognition and machine learning—Language translation (both natural and computer-oriented languages).

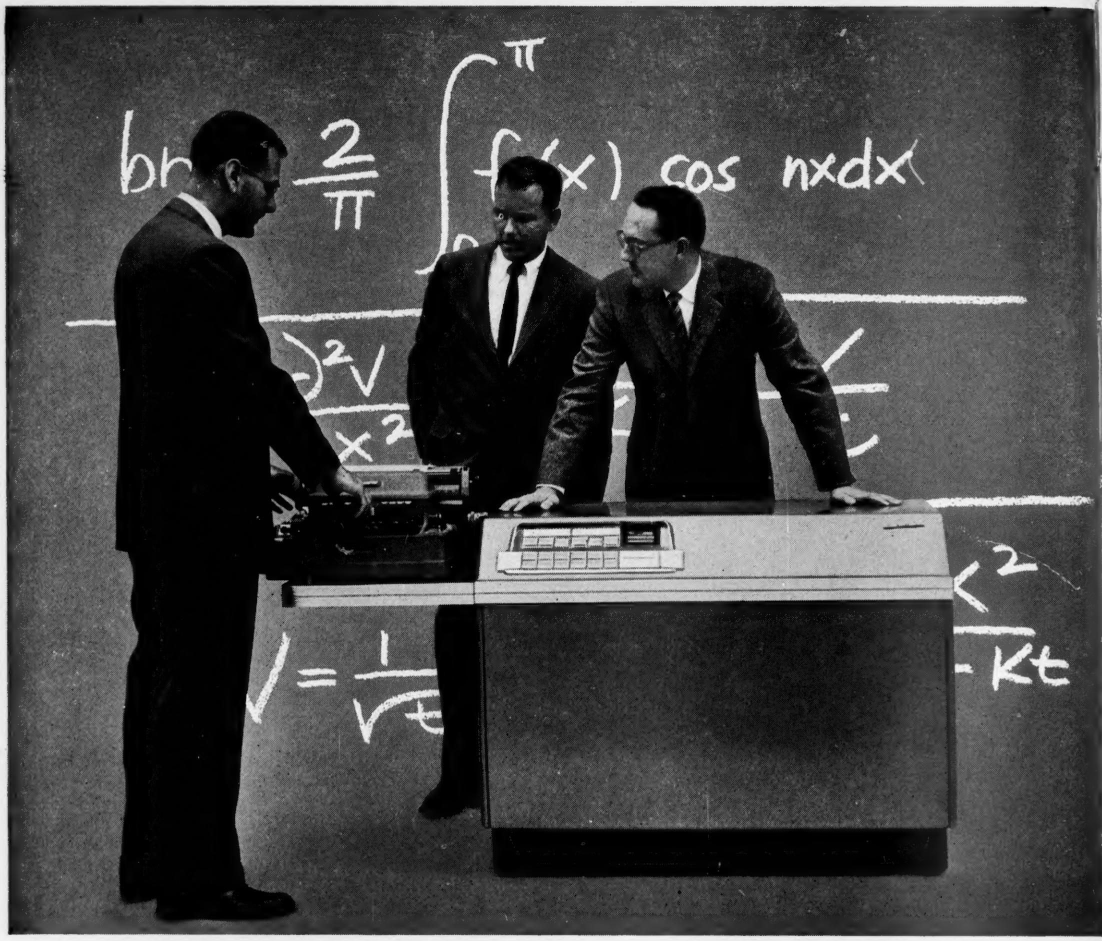
Those who desire additional information are invited to contact William Keefer at System Development Corporation, 2406 Colorado Avenue, Santa Monica, California.

SDC

SYSTEM DEVELOPMENT CORPORATION

Santa Monica, California

11-90



Producing High-Performance Low-Cost Magnetic Memory Cores For An Expanding Digital Computer Market

C. L. Snyder
Vice President, General Ceramics Corp.
Keasbey, N.J.

ELECTRONIC DIGITAL COMPUTERS were first reduced to practice in the middle 1940s. Since that time, as their speed and reliability have increased, these computers are being more and more widely used to solve industrial, and military engineering problems, handle production controls, and speed and simplify office procedures. One of the most important components in the computer system is the memory, since nearly every operation of the computer requires access to it.

Heart of the internal memory in most large modern computers is the ferrite magnetic memory core. This is the most reliable means yet developed of providing high speed random access memories, which permit information to be obtained in any sequence desired. When these tiny magnetic cores first became available in small volume, their cost, although competitive with that of other available systems, was high — nearly 50c apiece. This presented what seemed to be a problem to the growth of the computer industry but within the past five years General Ceramics, through plant investment and research, has reduced the cost to about 3c each, improved the yield of quality cores from 30% to 98%, and increased the production from 1,000 to 250,000 daily.

History

The first practical memory device for electronic digital computers was the mercury delay line, and some early digital computers were built using this storage method. In a few years these delay lines were replaced by cathode ray electrostatic storage tubes which operated more rapidly and permitted an increase in the size of the memory. But storage tubes are expensive to install and maintain and the memory was a volatile one and subject to errors every few hours. It soon was recognized that it was possible using magnetic devices to construct a memory storage system that would make no errors, be permanent in character, have a large capacity for memory bits in a relatively small space, and be much less expensive. A few memories were made using metallic tape-wound cores which demonstrated all these advantages with the exception of low cost.

In the meantime experiments were being conducted using ferrites as memory devices. These are magnetic ceramic materials which have many of the characteristics of metallic magnetic materials, but have an internal resistance which is enormously greater; ferrites reduce eddy currents to a negligible factor, and thus have their ability to handle higher frequencies. This in turn made them operable on far smaller electrical impulses. Experiments further showed that ferrites could be made which have a response time two to four times faster than the best of metallic tapes in coincident current circuits.

In the late 1940's Dr. Ernst Albers-Schoenberg, General Ceramics' Director of Research, and pioneer in the development of ferrite materials, developed a unique ferrite material which exhibited a rectangular hysteresis loop pattern. This material provided a practical solution to the memory storage problem. Essentially the same materials are being used in cores today.

The rectangular hysteresis loop ferrite core is magnetized by a small amount of driving energy which exceeds a certain threshold value, the core remaining magnetized when the energy is turned off. When an equal amount of reverse energy is applied, however, the magnetic polarity is reversed. The core remains in either of two states of stable magnetization unaffected by time or external influence other than the specifically applied driving force.

Each core stores a single bit of information which can be correlated with the numbers 1 or 0, which are the basis of the binary system of numbers used in digital computers. Through a system of circuits this information is broken down into arithmetic operations of addition and subtraction to provide the solution of the problem being solved.

In December, 1949, Dr. Albers-Schoenberg published his findings. They came to the attention of William Papian of Massachusetts Institute of Technology's Lincoln Laboratories who was actively involved in the development of a reliable large high-speed memory system. As a result, a joint development program evolved, in which General Ceramics and Lincoln Laboratories cooperated closely. Within a year ferrite cores were commercially available for use in random access memory devices. The first of these cores were used to replace the electrostatic storage tube memory in the MIT Whirlwind Digital Computer. The new memory equipped with the ferrite cores, while of the same size as the earlier system, had a speed three times as fast, occupied only one quarter the space and reduced the air conditioning load by four tons. A further result was reduction of memory errors from two to three each twenty-four hours to only one in the first six months of use.

Production

Ferrite cores, the latest of which have a response time of one microsecond, are produced in the shape of rings so that all of the flux generated by the driving circuit can be coupled to the largest possible area of magnetic material. The rings are extremely small. Of the two sizes now available, one has an outside diameter of .080" and an inside diameter of .050" while the other has an O.D. of .050" and I.D. of .030".

Commercial manufacture starts with pure red iron oxide, 95% finer than 0.5 microns, to which are added

oxides, hydroxides or carbonates of other bivalent metals to provide the desired magnetic properties. Binders and lubricants also are added to assist in subsequent forming operations. Protracted wet ball-milling yields a mixture that is very fine and homogeneous.

The ferrite material is dried, and from the product the cores are pressed and fired. Since firing is one of the major factors affecting performance, an entirely new kiln technology, based on exact control of temperatures, rates of heating and cooling, and special atmospheres, during heating up, soaking and cooling, has been developed for ferrite manufacture.

General Ceramics produces a broad line of ferrite products other than the rectangular hysteresis loop materials, and this broad development and manufacturing effort has led to materials and production control and economies that have been very advantageous in the production of the memory cores. These other ferrites have different chemical compositions, are subjected to different physical and thermal treatments and have magnetic properties which are different from those of the memory cores. They are designed to perform specific magnetic functions, many of which were formerly unattainable either in kind or degree. For example, one small ferrite antenna rod gathers feeble radio signals so effectively that it has rendered portable wire-wound antennae obsolete, while at the same time making possible miniature portable radios. Other types of ferrites have important applications: magnetic cores for recording heads, saturable reactors, deflection yokes, permeability tuners, permanent magnets, and special transformers. Some are magnetic materials specifically designed to yield high efficiencies within different frequency bands. Two unusual qualities may be noted. The first is that these magnets are electrical semi-conductors, with the result that eddy current losses can be reduced to very low levels. The second is that by altering the composition, a wide range of magnetic permeability and coercive force can be designed into the magnets. For example, a very high coercive force, which is a measure of the resistance to demagnetization, has been developed in certain barium ferrites, with the result that permanent magnets resist demagnetization to a greater degree than any other magnetic material.

Testing and Handling

No equipment existed to test finished memory cores when production began five years ago. The evolution of test equipment has run parallel to the development of the cores themselves. Some testers are now commercially available, but the design, development and modification of testing equipment by General Ceramics has become an integral part of the manufacturing operation. This equipment includes devices for measurement of permeability and coercive force, current calibrators, voltage calibrators, low level sense amplifiers, current sources, and high speed core handlers.

The two primary areas of consideration in the design of this equipment are current sources and core handling. The current source testing equipment simulates the smallest possible electrical information pulse while in-

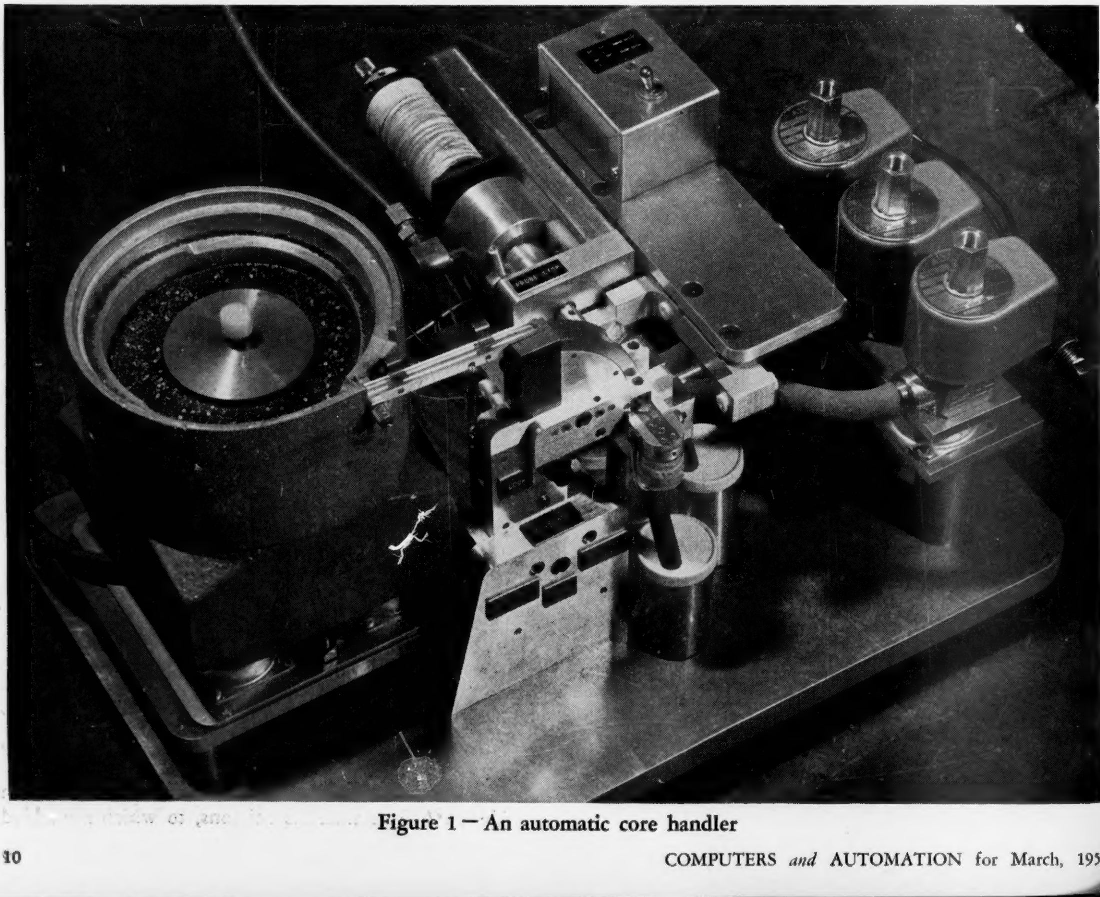


Figure 1 — An automatic core handler

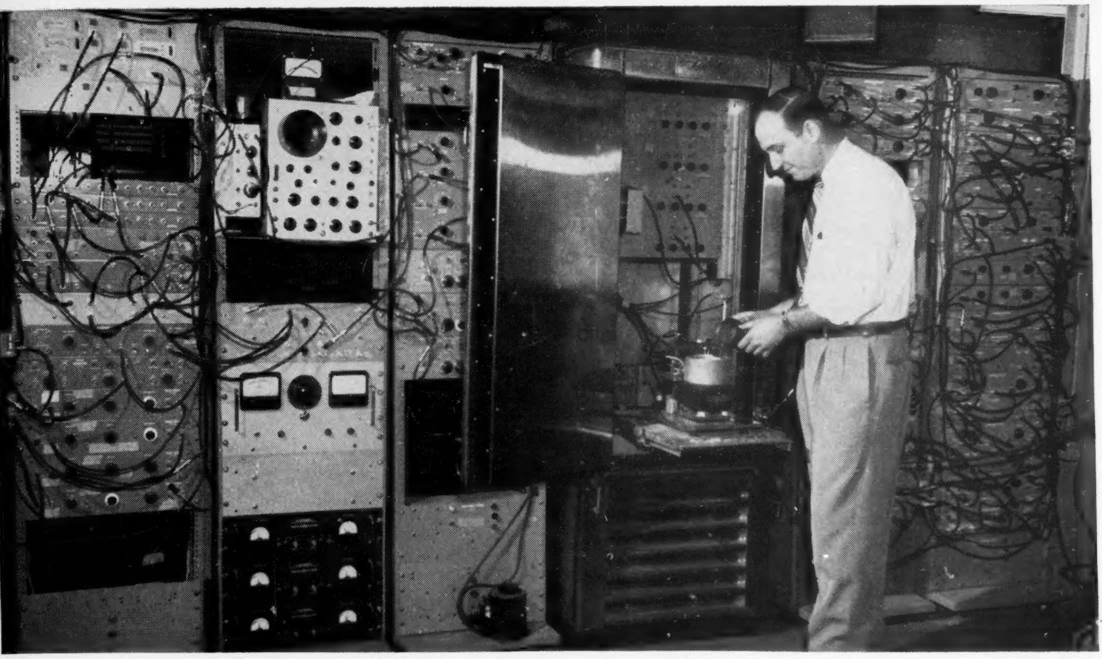


Figure 2 — An automatic core tester

troducing a high degree of disturbing outside influence into the wire system; this determines the core's stability level. But this has never presented a major problem.

Most of the difficulty in making test equipment has centered around handling the very small cores, which are about the size of a pin-head. Originally the operation was entirely manual, and a wire to contain the test current was placed through each core by hand. Only 1000-1500 cores could be tested daily by this method. An automatic core handler then was developed which handled 6000-8000 cores daily but still required the operator to determine the rejects.

The next step was the development of a fully automatic tester to eliminate human decision. The first of these handled one core per second or 25,000 per eight hour day.

Fully automatic handling and test equipment has since been upgraded twice. In the first of these improvements, core handling speed was increased to 4 per second and the equipment now in use handles 10 per second or 250,000 cores per eight hour day, as well as measuring additional parameters of the core.

As core testing and handling speed have increased, production improvements have kept pace and the core reject rate has dropped sharply.

Core Performance: Present and Future

Present day cores are used in large high-speed digital computers and such other equipment as buffer memories, digital voltmeters, industrial programmers, redundancy devices, even jukeboxes. They are uniform in quality and performance, are stable indefinitely, economical to use, inexpensive to measure and calibrate, and fast in response time. Development work, however, is being actively pursued and higher performance standards are continually being attained.

Production has begun on cores of .050 inches of outside diameter in contrast to the .080 inches of the earlier cores; this change permits many more bits of information to be stored per cubic foot. The smaller cores also allow the use of transistor drives with greater reliability and simpler circuitry. Presently available materials with switching times of about 1 microsecond soon will be complemented by new materials having twice the switching speed.

Thus, the struggle continues to improve and make perfect.

THE ART OF GETTING PUBLISHED

I. From Jordan and Van Deusen

Laguna Beach, Calif.

We are often asked if we guarantee the publication of technical articles that we may be commissioned to write. Our answer:

There is no inside track to getting an article published in the trade press. If the article is well written, informative, and newsworthy, it will be printed. If it does not meet this test, all the personal contacts (and advertising schedules) in the world will not make up for the lack.

Editors are constantly looking for good technical articles. . . .

Editors judge an article by just one measure: its value to the reader. The reader must get something out of the article or it will not be printed. The more technical the subject, the more difficult and important this becomes. Engineers cannot be convinced by unsupported claims or adjectives. They want to be educated but with facts. They can tell, like the editor, when a "technical" discussion is only an advertisement in editorial dress. . . .

II. From the Editor:

Hear! Hear!

NOVEL APPLICATIONS OF COMPUTERS

COMPUTER AIDS RESEARCH FOR BETTER BEEF

C. J. Brown
University of Arkansas
Fayetteville, Ark.

DEVELOPMENT OF MUCH more productive and economical types of beef cattle is being aimed for by use of an electronic computer, installed at the Department of Animal Industry and Veterinary Science at the University of Arkansas. The computer is a G-15 general purpose digital computer produced by the Computer Division of Bendix Aviation Corporation.

The computer will be programmed to determine and interpret trends and correlations in the qualities of beef cattle and allied livestock. Statistics concerning breeding, efficiency of production, mothering ability of cows, weight of animals, body measurements, and various feeding and digestive factors in different breeding groups, etc., will be processed.

Statistical data projected over generations of cattle eventually should take the guesswork out of breeding.

SIMULATION OF CONSUMERS' DECISIONS

C. Joseph Clawson
Facts Consolidated
Chicago, Ill.

(Based on a talk before the American Marketing Association, Chicago, Ill., December 30, 1958)

Computers are used in the simulation of the probable flight of an intercontinental ballistic missile or a space rocket: in the same way, it may soon be possible to give trial flights to promotional programs on electronic computers.

They may make it possible to forecast with greater accuracy the behavior of consumers in response to marketing programs which are under consideration.

I believe there are many indications that the decision-and-action process of consumers will soon be simulated, or at least reduced to a systematic set of mathematical functions which can be programmed onto an electronic computer. In this way, we will be thinking about a representative sample of consumers in a way similar to the way they think for themselves.

CREWLESS VEHICLES

Charles L. Patterson, Chairman of the Transit Authority of the City of New York, which operates the city subway trains, has reported on a year-long study of crewless trains. Engineers of the authority and four electronics companies have explored the feasibility of running subway trains by remote control. The shuttle subway trains between Times Square and Grand Central (about three blocks) would be a logical first test. If the system were successful, it could mean the transfer to other work of 90 percent of the 3100 motormen and 75 percent of the 3500 conductors now employed by the New York City Transit Authority.

Michael J. Quill, international president of the Transport Workers Union, and Matthew Guinan, president of the New York local, have protested the dangers of "tampering with the safety of millions of passengers daily." But they apparently did not discuss the point whether passengers might not be safer with guidance systems, that make fewer mistakes than human beings.

The Soviet Union has reported a recent test run of an automated train between Kuntsevo, near Moscow, and Usovo, a distance of about 300 miles. In this test, an automatic control system replaced the train engineer, made computations solving problems in connection with the train's movements, and interpreted coded information on the grade of the tracks, the distances between stations, and other such data.

The elevators in a number of New York's new office buildings with 20 to 30 floors have no human attendants. The automatic elevators appear to operate more safely and efficiently than those having human operators. There are no signs in those buildings however saying how the displaced elevator men are now earning their living.

AUTOMATED CAPITALISM

Edward G. Brender
Brender and Brender
Wayne, Mich.

Some time ago, a number of small groups of people got together to study the stock market. Needing education in the way that investments in the stocks may be wisely made and to learn how the stock market operates, the groups joined together in a cooperative effort, and established a National Association of Investment Clubs.

These clubs are composed of 10 to 15 people, who need guidance in their education, and learn by actually investing in stock of their choice. But what stock should they buy?

The NAIC published a four page "NAIC Stock Selection Guide," which formulates the principles and policies of the investments of the clubs. These principles require plotting sales and earnings records for 10 years past, and their projections for 5 years in the future. The price-earnings ratio, the dividend pay-out, and the return on invested capital are also averaged for 5 to 10 years. The current investment yield is also computed. A prediction is made by a formula for the possible high and low prices five years from now. From this information, zones for buying, holding, and selling, are established, and compared with the market price.

Doing this analysis for a stock manually required 1½

to 2 hours of work, and some pulling of teeth and tearing of hair. But one of our staff members who was in our club programmed this process for our Royal McBee LGP-30 computer. Zoom — 10 minutes analysis time! So we now enjoy 6 to 8 analyses per month to look at and consider each month. The computer program also permits speedy up-dating of the reports of the stocks that we have in our portfolio, as well as 40 other stocks that we have examined but not purchased.

Through cooperation, at least seven other clubs from Poughkeepsie to Phoenix are also using this investment analysis computer program.

The printed-out report is a delight to behold, with its alphanumeric, precise tabulation and color shifts.

Viva La Capitalism, and Computers!

UNIVERSITY STUDENT SCHEDULING BY DATATRON

Neva Sabbagh
Purdue Univ.
Lafayette, Ind.

Purdue University students of the past and even up to a few years ago remember the seemingly endless hours of waiting in line to be registered, first at the Registrar's Office, then at the Armory, and later in Quonset Huts. What a bother, they grumbled, to have to walk into registration headquarters, wait in line while the guy in front argued with the registration official, and then when your turn finally came, you found out that the class you had to be in — it was your last semester and it was a required course — was closed. This meant starting all over — again consulting with your advisor, again trekking to registration headquarters, again . . .

But that's all over now. At least the long lines are getting to be a thing of the past. Through the efforts of Mr. James F. Blakesley, Administrative Coordinator of Schedules and Space, and other staff members devoted to helping Purdue operate efficiently, Purdue's digital computer, the Datatron, has been adapted to the scheduling process. Purdue is the first university, so far as we know, to use this practical — and satisfactory — way to schedule students electronically. Although the machine was bought from ElectroData Division of Burroughs Corp. for research in the Statistical Laboratory, it was found to be of great use in student registration and scheduling.

The Datatron electronic digital computer "memorizes" in about five minutes the 1400 courses and 4000 divisions that may be selected by students. The machine also "knows" the course identification, the maximum size of each class, and the meeting time of each class. As students are scheduled and divisions of courses become filled, a method is available for opening additional divisions.

Here's how a student is scheduled electronically: He goes to his counselor and together they list the courses he is to take in the next semester. This information is translated into Datatron language through pre-punched cards and fed into the machine. In processing the schedule, the computer schedules first those courses with only one division (because this division has no alternate time schedule), and then continues to schedule courses by a pre-determined priority. The machine keeps track of available spaces and equalizes the number of students assigned to particular sections of a course by attempting to schedule the section with the most remaining spaces first. If a student plans to work, he signs up with his advisor for a period of "free time." If no conflict develops, this free time will be scheduled along with the other courses by the Datatron.

In a matter of seconds (in many cases 35 or 40), out of the computer comes the student's schedule of classes punched on cards. Tabulating equipment is used to produce the student's schedule in readable form.

Advantages of the Datatron are numerous. First, there is the speed of selecting sections of courses to meet the students' requests (free from conflicting hours). Second, course section enrollments are equalized. Third, the last student through the computer has nearly the same opportunity to be enrolled in the courses of his choice as the first student. Fourth, the instructors have classes of a more uniform size. An additional benefit of equalized enrollments is found in more effective use of instructional rooms; that is, fewer rooms are needed since the classes are spread among many rooms at various times instead of using a large number of rooms at a peak hour. Finally, the staff members previously busy with registration details are freed for counselling and instruction.

The machine is no more infallible of course than the information put into it by human beings. But, once it begins its electronic scheduling, it does a job no human being can possibly do in five seconds or perhaps 20 minutes. It is a certainty that no human can make such an even distribution of classes as the Datatron does in the same time limit.

Work on the idea of electronically scheduling students began in 1955. After much probing and testing, the first group of students was registered December 11, 1957. In order to sample a diversified group of students, agriculture and engineering students were chosen. Two hundred and nine freshman ags were registered successfully by the Datatron. The next day nearly 1600 freshman engineers were scheduled by the same procedure. A maximum time of 2 minutes and a minimum of five seconds was used in scheduling each student. This made an average of between 35-45 seconds for almost 1800 students. Since that time more than 20,000 registrations have been processed, with a similar average time for scheduling on the computer.

Enrollment is promising to double at Purdue University in the next few years and threatening to triple by 1970, but the Datatron still promises quicker and more practical individual scheduling of students. It will also give them the advantage of better classroom atmosphere, free from over-crowded conditions. The student is not turned into a mere number by the Datatron; he receives his own schedule tailored to his individual needs.

The University benefits in utilizing its staff to near-maximum efficiency in doing the job it was expected to do, and the number of rooms that are needed for instructional purposes are reduced to a minimum.

If any reader of this brief report is interested in this application and has access to a high speed computer, he is invited to contact Mr. James F. Blakesley, President's Office — Schedules and Space, Purdue Univ., Lafayette, Ind., for more information and details of the programming technique.

COMPUTER TALKS

1959 Western Joint Computer Conference, Fairmont Hotel, San Francisco, March 3 to 5, 1959

New Components and Circuits / C. L. Wanlass, Aeronutronic Systems, Inc.
A Multiload Transfluxor Memory / D. G. Hammel, W. L. Morgan and R. D. Sidnam, RCA
Design and Analysis of MAD Transfer Circuitry / D. R. Bennion and H. D. Crane, Stanford Research Institute
A Magnetic Matrix Memory for Semi-Permanent Information / D. H. Looney, Bell Telephone Laboratories
Card Changeable Nondestructive Readout Twistor Store / J. Janik, Jr., J. J. DeBuske and B. H. Simons, Bell Telephone Lab.
Square Loop Magnetic Logic Circuits / E. P. Stabler, General Electric
Information Retrieval and Machine Translation / C. Bourne, Stanford Research Institute
Relative Merits of General Purpose and Special Purpose Computers as Used for Information Retrieval / A. Opler and N. Baird, Computer Usage Co., Inc.
A Special Library Index Search Computer / B. Kessel, Computer Control Co., Inc., and A. DeLucia, Rome Air Development Center
Programmed Interpretation of Text as a Basis for Information Retrieval Systems / L. Doyle, System Development Corp.
A Theory of Information Retrieval / C. Walker, Hughes Aircraft Company
The Role of USAF Research and Development in Information Retrieval and Machine Translation / R. Samson, Rome Air Development Center
Industry's Role in Supporting High School Science Problems / Dr. Paul Hurd, Associate Professor of Education, Stanford University
Information Retrieval and Machine Translation / C. Bourne, Stanford Research Institute
Computing Educated Guesses / E. S. Spiegelthal, General Electric Company
A Memory or 314 Million Bits Capacity With Fast and Direct Access — Its Systems and Economic Considerations / N. Bishop, Time, Inc., and A. Dumey, Consultant
Information Retrieval on a High Speed Computer / A. Barton, V. Schatz and L. Caplan, General Electric Company
The Next 20 Years in Information Retrieval: Some Goals and Predictions / C. N. Mooers, Zator Company
Computer Communication / H. C. Martel, California Institute of Technology
Simulation of an Information Channel on the IBM 704 Computer / E. G. Newman and L. O. Nippe, IBM
A Compiler with An Analog-Oriented Input Language / Marvin L. Stein, Univ. of Minnesota, and Jack Rose and Donn B. Parker, Convair-Astronautics
Automatic Design of Logical Networks / T. C. Bartee, Mass. Inst. of Technology
The Role of Digital Computers in the Dynamic Optimization of Chemical Reactions / R. E. Kalman and R. W. Koepcke, Research Inst. for Advanced Study, Baltimore
Simulation of Human Problem Solving / W. G. Bouricius, IBM
Education and Methodology for Use of Computers / G. W. Brown, Univ. of Calif. at Los Angeles
The Role of the University in Computers, Data-Processing, and Related Fields / L. Fein, Consultant, Palo Alto, Calif.
The RCA 501 Assembly System / H. Bromberg, T. M. Hurewitz, and K. Kozarsky, RCA
A Program to Draw Multilevel Flow Charts / L. M. Haibt, IBM
A Compiler Capable of Learning / R. Arnold, Michigan State Univ.
Achieving Reliability in Operation Control / L. Fein, Consultant, Palo Alto, Calif.
Special Purpose Electronic Data Systems / M. V. Crowley, RCA
The Residue Number System / H. L. Garner, Univ. of Michigan
System Evaluation and Instrumentation for Military Special Purpose Digital Computer Systems / A. J. Strassman and L. H. Kurkjian, Hughes Aircraft Co.
Automatic Failure Recovery in a Digital Data Processing System / R. H. Doyle, R. A. Meyer and R. P. Pedowitz, IBM
Learning Concepts and Pattern Analysis / P. Suppes, Stanford Univ.
A High-Speed Data Translator for Computer Simulation of Speech and Television Devices / E. E. David, M. V. Mathews, and H. S. McDonald, Bell Telephone Lab.
Some Experiments in Machine Learning / H. Campaigne, American Univ., Washington, D.C.
Some Communication Aspects of Character Sensing Systems / C. C. Heasley, Jr., Intelligent Machines Research Corp.
An Approach to Computers That Perceive, Learn, and Reason / P. H. Greene, Univ. of Chicago
Military Applications / H. Silverstein, Dept. of the Army, Washington, D.C.

Drafting Digital Computers Into Tactical Combat / Capt. A. B. Crawford, Jr., Fort Huachuca, Arizona

Data Transmission Equipment Concepts for Fieldata / Capt. W. F. Luebbert, Fort Monmouth, New Jersey

A High-Accuracy Real-Time Digital Computer / W. J. Milan-Kamski, EPSCO

The Man-Computer Team in Space Ecology / J. McLeod, Convair, and J. Stroud, Naval Electronics Laboratory

New Machines and Systems / M. Montalbano, Kaiser Steel Corp.

The RCA 501 High Speed Printers — The Story of a Product Development / C. Eckel and D. Flechtner, RCA

A Digital Computer for Industrial Process Analysis and Control / E. L. Braun, Genesys Corp.

The Burroughs 220 High Speed Printer System / F. Bauer, Electro-Data Corp.

The ACRE Computer — A Digital Computer for a Missile Checkout System / R. I. Tanaka, Lockheed Aircraft Corp.

The IBM 7070 Data Processing System / J. Svigals, IBM

Computer Applications in Business Environments / R. R. Crane, Touche, Niven, Bailey & Smart, Detroit

An Organizational Approach to Electronic Data Processing / G. Fleming, Boeing Airplane Co.

Developing a Long-Range Plan for Corporate Methods and the Dependence on Electronic Data Processing / N. J. Ream, Lockheed Aircraft Corp.

A Long-Range Electronic Data Processing Plan for a National Multi-Plant Manufacturing Company / G. Redmond, Chrysler Corp.

Dynamic Production Scheduling of the Job Shop Operation / L. N. Caplan and V. L. Schatz, General Electric Co.

Numerical Analysis / R. D. Levee, Univ. of Calif., Lawrence Radiation Lab.

Survey of Numerical Analysis / G. E. Forsythe, Stanford University

More Accurate Linear Least Squares / R. Von Holdt, Univ. of Calif. Lawrence Radiation Lab.

The Cordic Computer: (1) The Cordic Transcendental Computing Technique / J. E. Volder, Convair; (2) Implementation of Coordinate Rotation and Other Trigonometric Function Algorithms by Cordic / D. R. Clutterham, Convair; (3) Decimal-Binary Conversions in Cordic / D. H. Daggett, Convair

Monte Carlo Techniques Applied to Statistical Mechanics / W. W. Wood, Los Alamos Scientific Lab.

Real-Time Digital Analysis and Error Compensating Techniques / W. Ito, Minneapolis-Honeywell Regulator Co.

Automatic Digital Matric Structural Analysis / B. Klein and M. M. Chirico, Convair

Problems of the Future / S. Ulam, Los Alamos Scientific Lab.

"Blue Sky" Session / L. N. Ridenour, Lockheed Aircraft Corp.

A New Approach to High-Speed Logic / W. D. Rowe, Westinghouse Electric Corp.

Experiments in Information Retrieval / R. Cochran, General Electric Co.

Communication Across Language Barriers / W. F. Whitmore, Dept. of the Navy, Washington, D.C.

Program Design To Achieve Maximum Machine Utilization in a Real Time Computing System / A. F. Rosene, Sylvania

Pattern and Character Recognition Systems — Picture Processing by a Net of Neuron-Like Elements / L. A. Kamentsky, Bell Telephone Lab.

Philosophy and Responsibility of Computers in Society / R. W. Tyler, Center for Advanced Study in the Behavioral Sciences, Stanford University

Social Responsibility of Engineers / F. Wood, IBM

Emergency Simulation of the President of the United States / L. Sutro, Datamatic

Can Computers Help Solve Society's Problems / J. Rothstein, Edgerton, Germeshausen & Grier, Inc.

Measurement of Social Change / R. L. Meier, Univ. of Michigan

Analog Simulation / J. E. Sherman, Lockheed Aircraft Corp.

Simulation of Sampled Data Systems Using Analog-to-Digital Converters / M. S. Shumate, Space Technology Lab. Thompson-Ramo-Wooldridge Corp.

A Transistorized Analog Memory for Functions of Two Variables / P. C. Sherertz, and L. E. Steffen, Convair

A Time-Sharing Analog Computer / J. V. Reihing, Jr., Westinghouse Electric Corporation

Computers — The Answer to Real-Time Flight Analysis / G. Hintze, Chief, Flight Simulation Lab., White Sands Missile Range

Symbolic Language Translation / E. C. Gluesing, Remington Rand

New Horizons In Computer Technology / H. Aiken, Harvard Univ.

New Applications of Computer Technology / H. D. Huskey, Univ. of Calif.

A Generalized Scanner for Pattern and Character Recognition Studies / W. H. Highleyman and L. A. Kamentsky, Bell Telephone Lab.

File Searching Using Variable Length Keys / R. De La Briandais, U.S. Naval Ordnance Lab.

**1959 Electronic Components Conference,
Benjamin Franklin Hotel, Philadelphia, Pa.,
May 6, 7, 8, 1959**

Session on High Speed Data Processing
(May 6, morning):

Functional Components / R. J. Cypser, IBM Corporation

Electronic Components for Future Computers / N. M. Abov-Taleb, IBM Corporation

Magnetic Domain Switching in Evaporated Magnetic Films / David W. Moore, Servo-mechanisms, Inc.

The Fabrication and Properties of Memory Elements Using Electrodeposited Thin Magnetic Films of 82-18 Nickel Iron / I. W. Wolf, H. W. Katz, General Electric Electronics Laboratory, and A. E. Brain, Stanford Research Institute

CORRECTION

In the January, 1959, issue of **Computers and Automation**, in the article "Symbolic Logic and Automatic Computers, Part 3," on page 19, on the last line, a tilde ($\sim$) should be inserted before the expression "xM". On page 20, left column, line 6, the same insertion should be made before the same expression, and again on line 12. Our thanks to William F. Culliton of Niagara Falls, N.Y., for catching these three errors.

Make Your Tabulating Department a Service Department

Edmond W. McNamara
Ed McNamara Associates
Bridgeport, Conn.

STUDENTS ANALYZE THE evolution of electronic data processing into certain stages of development. One of the early stages pictures the giants of industry, the large insurance and utility companies, and the government pioneering in the use of electronics against a backdrop studded with many pronounced question marks. While off to the side, the smaller, more conservative, more timid managements wait for the first full audit of results before they take any active step to become involved with the spectacular and expensive new tools of data processing.

Some of these managers await the returns with eager anticipation. They seek justification for going out on thin ice in hopes of finding solutions to their clerical problems. Others are far less eager. In fact, some of them hope that the new equipment and methods will prove to be failures so that they can justify a continuation of their old ways and not muddy the water of their existing systems — at least not until their own personal retirement from work has excused them from the responsibility for action.

Reports on Computer Applications

Meanwhile the reports roll in. In some ways they are encouraging. Yet in many respects there is an emphasis on the negative, and an air of caution. For example, there is the recently published "Computer Use Report," by the Systems and Procedures Association's Empire State Chapter's Research Committee. This was published by the Systems and Procedures Association, Penobscot Bldg., Detroit, Mich., in 1958, 12 pages long. It is a "statistical information release," covering 281 replies to a questionnaire. 82 organizations reported applications in service. The total number of computers involved in the study is 203, about 15% of the total medium and large scale computers in use as determined by a recent census. Table 1 analyzes about 270 applications accepted for electronic computer operation (82 companies reporting). Table 2 covers about 160 applications rejected (63 companies reporting, 23 of which have applications in service). Five more tables analyze occurrence of applications by size of firm, industry, etc.

This report, however, has the following introduction: Information on the success or lack of success of the use of electronic data processing equipment has, up to this point, been somewhat vague. To the best of our knowledge, no specific figures have been released from any source that can be used to determine with any accuracy the acceptance or rejection of such equipment. We believe that this report contributes to help fill this void in the field of electronic data processing.

In the section devoted to applications rejected, the rejections are analyzed as to when they were rejected, such as: *during the study, after study, in the programming stage,* and so on. And then the reasons for rejection are listed as follows:

Too costly
Volume of data too large
Volume of data too small
Routine has too many exceptions
Programming too difficult
Lack of reference to account history
Inadequate input-output equipment
Inadequate input-data sources
Fear of equipment obsolescence
Lack of continued top management support
Lack of employee cooperation
Memory capacity too small
Access time too high
Excessive down time

Underlying Reasons for Rejection or Failure

Psychologists tell us that there are two reasons for everything, the obvious and the underlying. Perhaps this explains why two of the major reasons for rejection and ultimate failure are not even mentioned. Nor is their omission a reflection on those who compiled the report. The two major reasons I refer to are:

1. Failure to do sound systems analysis before forging ahead into electronic mechanization.
2. Failure to establish proper operating policy as to organizational location and role of the data processing function.

On this point, we might consider a few significant excerpts from another recent publication, "The Ram Myth," Apr. 1958 issue of EDP Analyzer, by Canning, Sisson, and Associates.

"With all the excitement about large volume random access memories for EDP systems, we think the time has come to add a few words of caution about them . . .
"To state it bluntly, we think that RAM memories are heavily booby-trapped for the unwary . . .
". . . we feel that only a few of the many orders on the books for RAM systems are really valid applications . . .
"The answer to the proper use of RAMs is, of course, high quality systems plans. Equipment always is a poor substitute for thinking. . . ."

Getting back to the two major reasons cited above for rejection and failure, my experience tells me that these are perhaps the two most serious reasons. Yet they are the ones least discussed or admitted by official spokesmen of companies engaged in electronic data processing programs. You get much of your information "off the record." Much of it must be deduced. Here is a case in point.

Inadequate Systems Work

A large, national organization solicited help in June of 19.8. They wanted to hire a systems man. The essence of my questions and their answers follows:

Q. What is this man to do? What will be the scope of his job?
A. He will have to hire and train assistants in programming and be ready for the installation of a medium scale computer.
Q. To whom will this man report?
A. We're not sure yet.
Q. When is the computer scheduled for delivery?
A. Next December.
Q. Nineteen fifty-nine?
A. No, No! This year, fifty-eight.
Q. Is this a basic computer, or . . .
A. It is the basic unit first and tape units will be delivered in 1959.
Q. Do you have anybody working on systems now?
A. No.
Q. Who has done the systems analysis?
A. Nobody; that is why we want to hire a systems man.
Q. Who chose the computer?
A. An executive [whose knowledge and background in the field was slightly above zero].
Q. Who advised this executive?
A. The equipment salesman.
Q. Who determined the feasibility?
A. The equipment salesman.

What would you consider are the chances of success in this installation? If it fails, what do you think will be recited as the reason for failure? Lack of employee cooperation? . . . , memory capacity too small?

Six months later I revisited the company whose computer was due in December 1958. I found the computer installed in a room far removed from the tabulating department (the floor there wouldn't hold the weight of the computer). The computer had been in for two weeks. It had actually been running but not very much. Three young service engineers, with a full library of charts and diagrams, were still tinkering and experimenting. The harried systems man told me he had been working "all hours" trying to get the thing running, and was busy explaining to a member of management that there are mechanical bugs, etc., etc.

Operating Policy on Role of Data Processing Function

Perhaps some organizations can get by without classical systems analysis. So let us consider the second of the two major reasons mentioned — failure to establish adequate operating policy as to the place and role of the data processing function.

Since a great number of computer applications are an outgrowth of punch card tabulating functions, let us concentrate our attention back in the tabulating department and inquire immediately: Is your tabulating department a service department?

There are many illogical situations in business office Think of the systems function, fettered under the jurisdiction of an old school accounting officer. Or think of the tabulating department used as a tool at the whim of the controller; keeping only the records he wants kept, making only the reports and analyses that serve his purposes; actually providing an imbalance of information which distracts management attention from important matters and gives birth to a cardinal sin of data processing, duplicate records. These duplicate records are maintained by each division as a defense against the highly mechanized record keeping in the controller area. Let us not carry this illogical philosophy and thinking into computer installations — if we want success. One of the best insurances against this carryover of illogical thinking is to make your tabulating department a service department now.

Overloaded Tabulating Department

Writing in SYSTEMS magazine, Vincent P. Connolly observed:

> "A sudden demand for a tab report by the executive committee of a large steel mill confronted its comptroller. The chore, accepted as routine, revealed that the tab department on three shifts was working just about to capacity. Investigation showed that any employee in the organization on the level of supervisor could requisition a machine tabulation job, while the tab accountant had no discretion, only a squawk, abou taking it on."

This far from healthy situation is not uncommon.

Underloaded Tabulating Department

In other companies we find a deplorable situatio which is the opposite of the above. The tabulating department is on a one-shift basis and overtime is frowned upon. In this situation the machine accountant, through his superior, exercises what may be too much discretion — to the extent that the services of the electric accounting machines are denied to legitimate users. In some situations desirable reports either are done by longhand methods or on some cumbersome office machine, or not done at all.

Such operating conditions emphasize the need for a intelligent perspective in relation to the use of tabulating equipment; a perspective and an approach which help to furnish maximum service in the issuance of essential reports and analyses, on time, and at minimum cost.

In one medium size company whose tab department was on a one-shift basis on the controller's department, it was found that their "loaded to the hilt" situation not only denied the company the clerical savings of mechanical preparation of reports, but it presented a serious roadblock to any unemotional, openminded approach to the possibilities of integrated or electronic data processing applications. It was recommended that if they were ever to get into a position to benefit from integrated application of machines to paperwork, they must first of all break the road block.

Basic Principles

To begin with, management had to agree that in the area of control reports for management there are three

main considerations: 1) the objective of the report; 2) the content or requirements of the report; and 3) the cost of preparation, issuance and use of the report.

Next a review of policies showed that it was explicitly not their accounting policy to charge individual departments for the reports that were prepared specifically for them in the tabulating section. The rental cost of equipment, supplies and salaries of operating personnel were being charged, against a budgeted allowance, to the factory accounting department. It was pointed out to management that this lack of specific accounting charges for reports defeats the establishment of sound requirements, specifications, and economic justification for reports. We were able to illustrate how some reports were being run simply because "the right guy had asked for them" or some one had happened to ask for them at the right time, or because "they always ran that report in tabulating."

Accounting Charges for Services Performed

We stressed that tabulating work is of a service nature and that the concept of service cannot be properly developed if accounting charges are not made for services performed. Furthermore, we pointed out that even an approved report on the approved list, suffers if specific accounting for services rendered is lacking. The following two paragraphs from our report to management cover this point:

> To get a concrete picture of the type of problem created by your present policy let us consider the area of statistical sales reporting and analysis. From a sales administration standpoint, Sales Management rightfully has the authority to realign geographic territories, to reassign salesmen or to reassign accounts. The manner and degree to which these steps are taken has direct bearing on the cost of administering your machine accounting section. Without a "charge for service" concept your machine accounting section is subject to conditions which encourage improvisation and short cuts; and which require costly manual operations and extra difficult schedules, all of which reflect unfavorably upon the machine accounting section and on the equipment used. Because all work performed in the machine accounting section is charged to the factory accounting department, it puts them under the pressure of their departmental budget. This produces a tendency to do the minimum and often results in unsatisfactory sales reports coming off the machines — of which there is ample evidence.
>
> We suggested that as a matter of philosophy and policy any department of the company should have equal right to request a report or an analysis that would help them in their departmental operations. Based on this request a cost of performing the service would be computed by the machine accounting section. If the using department agreed to pay the cost and management gave the report the blessing, then the report would be produced on a service basis by the machine accounting section and charged, accountingwise, to the benefiting department or departments.

Price Tags on Reports

Based on this thesis, management agreed to change policy to conform to a service concept. To implement this we worked out a set of rates per hour to be used as standard service charges for tabulating reports (see appendix A.) We also established a budgeted allowance for each division against which reports would be charged — with the Division Head's approval.

Now each report has a price tag. The using department pays the price. A re-evaluation of existing reports in terms of what it costs versus how useful it may be, is serving as a real control over the number and kinds of reports being turned out by the tabulating department. More important, having removed the roadblock, the company is now in a position to go ahead with plans for future use of their equipment — interim and long range. To this end they have established an office automation committee. The work of this committee is to review present procedures and methods and examine the possibilities of instituting integrated data, or electronic data processing methods into their reporting processes. If they do develop a feasible plan, they know that they will have a greener light based on the merits and economic justification of the proposed application. They will not have to worry about being stifled by an unscientific situation such as observed by Mr. Connolly.

APPENDIX A

SCHEDULE OF SERVICE CHARGES FOR IBM TAB REPORTS

	Rental Monthly	Cost Yearly	Excise Tax	Total	Hourly* Cost	Labor	Total
Key Punch Alpha.	40.	480.	48.	528.	.44	4.68	5.12
Key Punch Numerical	35.	420.	42.	462.	.39	4.68	5.07
Key Punch Numerical	35.	420.	42.	462.	.39	4.68	5.07
Key Verifier	50.	600.	60.	660.	.55	4.68	5.23
Collator	100.	1200.	120.	1220.	1.10	5.46	6.56
Sorter	55.	660.	66.	726.	.61	5.46	6.07
Tab. 402	440.	5280.	528.	5808.	4.84	5.46	10.30
Reproducer 514	110.	1320.	132.	1452.	1.21	5.46	6.67
Calculator 602-A	245.	2940.	294.	3234.	.70	5.46	8.16
		13320.	1332.	14652.			

Labor @ 1.80/hr + 160% overhead = 4.68

Labor @ 2.10/hr + 160% overhead = 5.46

*Based on 60% Efficiency Normal Operation, 1200 hrs. per yr.

*Monthly rental figures subject to change.

SURVEY OF RECENT ARTICLES

Beginning in this issue, we plan to publish frequently a survey of articles related to computers and data processors, and their applications and implications, occurring in certain magazines. We hope to cover at least the following magazines, beginning with issues dated January 1, 1959, or later:

Automatic Control
Automation
Automation and Automatic Equipment News (British)
Business Week
Control Engineering
Datamation
Electronic Design
Electronics
Harvard Business Review
Industrial Research
Instruments and Automation
ISA Journal
Proceedings of the IRE
Management Science
The Office
Scientific American

It is not easy to look into more than fifteen magazines each month, and make a search; the purpose of this type of reference information is to help anybody interested in computers find articles of particular relation to this field in these magazines.

For each article, we shall publish: the title of the article / the name of the author(s) / the magazine and issue where it appears / the publisher's name and address / two or three sentences telling what the article is about.

World Brains Ponder Mechanisation of Thought Processes / G. Mobell / Automation and Automatic Equipment News, vol. 4, no. 5, Jan., '59, p 929 / A. and A. E. News, 9 Gough Square, Fleet St., London, E.C. 4, Eng.

A report of the Teddington, Middlesex, symposium on advanced electronic machines which perform logical operations, and certain other "intelligence" operations. The findings and opinions of certain international scientists are cited.

How Electronics Controls Depth of Anesthesia / J. Weldon Bellville, M.D., Sloan-Kettering Institute, New York, and G. M. Attura, Chief Engineer, Industrial Control Co., Lindenhurst, N.Y. / Electronics, vol. 32, no. 5, Jan. 30, 1959, p 43 / McGraw-Hill, 330 West 42 St., New York

Automatic controls may be used to check continuously the "border-of-wakefulness" of a patient undergoing a surgical operation. A servo-driven automatic system replaces the human anesthesiologist in the administration of anesthetic agents; it regulates the amount of anesthetic being administered.

Mechanization in a British Public Library / John Grindrod / The Office, vol. 49, no. 2, Feb., '59, p 16 / The Office, Office Publications Inc., 232 Madison Ave., New York 16, N.Y.

The use of both marginal punched cards and machine tabulating cards in London's libraries; how the systems are effectively used, and how much they cost.

Digital System Positions Shafts Over Phone Line / R. B. Palmiter, Chief Electronics Engr., Amer. Mach. and Foundry Co. / Electronics, vol. 32, no. 7, Feb. 13, 1959, p 62 / McGraw-Hill, 330 West 42 St., New York

A modulator superimposes positions of master shaft expressed in digital codes on a carrier wave; mixes the modulated signal with control information; transmits the composite signal at the rate of 750 bits per second. An amplifier and demodulator reproduces the original signals, which are then compared with positions of slave shafts expressed in digital codes. Differences are then converted into analog signals correcting the slave shafts.

Magnetic Drum Provides Analog Time Delay / H. L. Daniels and D. K. Sampson, Remington Rand Univac, Division of Sperry Rand Corp., St. Paul, Minn. / Electronics, vol. 32, no. 6, Feb. 6, 1959, p 44 / McGraw-Hill, 330 West 42 St., New York

A relatively uncomplicated drum recording system has been developed to make analog simulations in designing continuous-processing systems, which provide a time delay. In a highly stable system, applicable also to tape, precision of 0.1 percent is exceeded, between recorded and played-back low-frequency analog voltages.

Tape Recording System Speeds Data Processing / Way Dong Woo, DATAmatic Div., Minneapolis - Honeywell Regulator Co., Newton Highlands, Mass. / Electronics, vol. 32, no. 6, Feb. 6, 1959, p 56 / McGraw-Hill, 330 West 42 St., New York

The use of a technique for recording pulse duration and a 31-channel block format give large information content while minimizing "dead space" and effec[t] from tape skew, plus the ability to re-record on individual blocks. These unique uses of magnetic tape enable a data processing system to handle information at a rate of 40,000 alpha-numeric characters per second.

Automatic Failure Recovery in a Digital Computer / R. H. Doyle, R. A. Meyer, and R. P. Perdowitz / IBM Journal of Research and Development, vol. 3, no. 1, Jan., '59, p 2 / IBM Corp., 590 Madison Ave., New York 22, N.Y.

A program which enables a complete digital data processing system to discover and correct its own errors. The "Fix" program compensates for its errors, achieving recovery with a negligible loss of time. Some methods of the program are discussed, as well as reliability techniques, program design, and recovery procedures.

On the Mathematical Theory of Error-Correcting Codes / H. S. Shapiro, and D. L. Slotnick / IBM Journal of Research and Development, vol. 3, no. 1, Jan., '59, p 25 / IBM Corp., 590 Madison Ave., New York 22, N.Y.

A discussion of the use of "Hamming codes" for efficient transmission of binary data over a noisy channel. Hamming reconstruction considered error-free signalling over a channel which corrupts no more than one binary digit in each sequence of length n; the authors consider the problem for channels which can corrupt a greater number of digits.

An Experimental Modulation-Demodulation Scheme for High-Speed Data Transmission / E. Hopner / IBM Journal of Research and Development, vol. 3, no. 1, Jan., '59, p 74 / IBM Corp., 590 Madison Ave., New York 22, N.Y.

The theoretical and practical problems involved in a system designed to determine speed and reliability limitations on transmitting binary data over telephones designed for speech transmission. Prob-

[Please turn to page 25]

The all-transistorized Honeywell 800 is the only computer that gives you the ability to process up to eight programs *simultaneously* — each *independently* written and automatically controlled.

No complex and costly programming is necessary to utilize the full efficiency of the Honeywell 800; a single powerful control unit supervises each and every independent operation speeding in parallel.

This achievement we call *automatically controlled parallel processing*. Its practical economic advantages are sizable for work loads large and small, business or scientific.

For example, you could run off a payroll, update your inventory and schedule production all at the same time, and all as independent jobs. And if your engineering staff needed to solve a complex scientific problem in a hurry, you could put that on Honeywell 800 too — *while data processing is going on.*

All these operations are meshed into a machine-determined schedule, always geared to utilize Honeywell 800 to its maximum efficiency. The central processor does not wait for relatively slow mechanical operations such as card reading or printing. All programs are *automatically* dovetailed to fill in "dead time" when the computer would otherwise lie idle.

Honeywell 800 thus introduces heretofore unimagined simplicity, efficiency and economy in this vital area of programming and scheduling. Your entire day's work can now be accomplished smoothly and on schedule with several of your key programs operating in parallel and automatically controlled.

The profitable use of the basic Honeywell 800 system begins far down the ladder to include relatively small volumes of work, and it can be utilized to accommodate your company's growth for years to come. This extraordinary capacity can be expanded at any time in small steps and at small cost. No management need make such additions until they can efficiently and profitably use them.

And you can't outgrow Honeywell 800. Its tremendous potential capacity plus its ability to operate more than a dozen data processing devices simultaneously make it your profitable partner *indefinitely*. And with Honeywell 800 you will never again have to face the cost of reprogramming.

Does all this sound costly? Honeywell 800 is competitively priced with other systems. In a working day it can process more data per dollar than any other computer.

Both the equipment and the programs of Honeywell 800 are backed by years of experience — and the caliber of service which users of Honeywell's DATAmatic 1000 have come to expect.

Vital Statistics of The Honeywell 800

Word Definition
12 decimal digits, 8 alphanumeric characters or 48 binary digits

Memory Size
4,096 to 16,384 words

Order Structure
Three-address

Internal Operating Speeds
Single active address operations—60,000 per second
Three-address operations—30,000 per second
Information transfer rate—140,000 words per second
Accumulations—125,000 per second

Input-Output
MAGNETIC TAPE (¾" wide)
Speed—96,000 decimal digits per second per unit
Tape Capacity—up to 20,000,000 decimal digits (Maximum of eight units reading and eight units writing in simultaneous operation)

STANDARD CARD READER—240 cards per minute (Maximum of 8 units in simultaneous operation)

HIGH SPEED CARD READER—750 cards per minute (Maximum of eight units in simultaneous operation)

STANDARD PRINTER—150 lines per minute (Maximum of eight units in simultaneous operation)

HIGH-SPEED PRINTER—600/900 lines per minute (Maximum of 8 units in simultaneous operation)

STANDARD CARD PUNCH—100 cards per minute (Maximum of 8 units in simultaneous operation)

HIGH-SPEED CARD PUNCH—200 cards per minute (Maximum of eight units in simultaneous operation)

Standard Features
1. Parallel processing of up to eight independent programs
2. Parallel operation of input output devices
3. Binary and decimal arithmetic
4. Indexing
5. Word masking
6. Tape reading in either direction
7. Fast tape rewind
8. On-line inquiry processing
9. Multi-function instructions
10. Orthotronic Control
11. Automatic programming routines
12. Library routines
13. Bi-sequence operation mode

Optional Features
Floating-point arithmetic
Random-access storage
Paper-tape input-output equipment

How To Get More Facts
If you would like more information about Honeywell 800, please let us know. We will send you complete details by return mail. Write Minneapolis-Honeywell, DATAmatic Division, Dept. A, Newton Highlands 61, Massachusetts.

Honeywell

H HONEYWELL DATAmatic
ELECTRONIC DATA PROCESSING

OPPORTUNITIES AT HONEYWELL

for experienced methods analysts and engineers

The overwhelming acceptance of Honeywell 800 has created immediate openings for ambitious and imaginative people with experience in the field of electronic data processing. If you are looking for the opportunity to make substantial contributions to advances in this field, if you seek the recognition that comes through performing difficult assignments well, if you enjoy working with competent, stimulating associates on projects that have solid management support, consider the following:

SYSTEMS AND METHODS ANALYSTS

Systems and Methods Analysts assist Sales Engineers in analyzing and developing potential customer applications. They provide the necessary training and guidance to assure optimum utilization of the system, combining a knowledge of the customers office systems and procedures with their command of the Honeywell 800 system.

Formal background desired:

High academic standing in business administration or a field of science.

Data processing or computer programming experience desirable.

SYSTEMS ANALYSIS ENGINEERS

Systems Analysis Engineers are responsible for advanced logical and systems design and evaluation; the design and implementation of compilers, utility routines, operating procedures for automatic routines, library subroutines; test routines; and new automatic programming techniques.

Formal background desired:

High academic standing in a field of science.

Data processing experience and advanced degrees desirable.

DESIGN AND DEVELOPMENT ENGINEERING

Depending on training, experience and qualifications; systems, circuit and logical design projects are available involving the advanced application of transistors, cores, tubes, diodes, and a variety of magnetic devices; electronic and electromechanical design of manipulative memory and peripheral conversion equipment; component evaluation and design; or the design of complex digital systems test equipment.

Formal background desired:

Electronic Engineering.

Physics.

Mechanical Engineering.

SEND RESUME TO:

Personnel Director, Dept. 10
Minneapolis-Honeywell Regulator Company
DATAmatic Division
Newton Highlands 61, Massachusetts

Honeywell

DATAmatic
ELECTRONIC DATA PROCESSING

Survey of Recent Articles

[Continued from page 20]

ems such as impulse noise, phase distortion and choice of modulation scheme, are covered, while performance of the equipment is reported with the reliabilities experienced at 600, 1000, 1600, and 2400 bits per second.

Fast Automation — Britain's Salvation / J. W. Murray / Automation and Automatic Equipment News, vol. 4, no. 5, Jan., '59, p 904 / Automation and Automatic Equipment News, 9 Gough Sq., Fleet St., London, E.C. 4, Eng.

The seventh and concluding article in a series by the author on the problems of automation. The series dealt with comparative economic and political problems in the United States, Great Britain, and the Soviet Union. This article discusses future prosperity based upon automation.

Diffusion Attenuation, Part I / J. A. Swanson / IBM Journal of Research and Development, vol. 3, no. 1, Jan., '59, p 13 / IBM Corp., 590 Madison Ave., New York 22, N.Y.

The problem of calculating the attenuation of signals consisting of compensated space charges moving in an electric field of general, but prescribed, form is solved by pertubation methods. An iteration process is developed for obtaining the general solution in the one-dimensional case; asymptotic formulas for attenuation and phase shift are derived.

A Survey of British Digital Computers

(Part I)

Joseph L. F. De Kerf
Research Laboratories
Gevaert Photo-Producten N.V.
Mortsel, Belgium

Introduction

IN THE United Kingdom, as in the United States, most of the innovations in design, development, and use of computers, have come from university and other scientific research laboratories. Sometimes these studies were supported by government or interested manufacturers.

As most of us know the first automatic digital calculator was designed by a British subject, Charles Babbage. Though constructed in parts, his engines were never completed. It was only about 1944 that, in the U.S., H. H. Aiken set the first digital computer into operation: the IBM ASCC or Mark I (Harvard University).

Since that time a lot of pioneer work has been done in the United Kingdom. The first computer using magnetic drum storage, the ARC, was constructed by A. D. and K. V. Booth, both of Birkbeck College. The prototype SEC and the APE(X)C series followed later. The first British computer with delay line storage, EDSAC I, was constructed by M. V. Wilkes of Cambridge University. Recently an expanded type (EDSAC II) with magnetic core storage has been completed. Another computer with delay lines, the well-known Pilot ACE, was completed at the National Physical Laboratories, the counterpart of the U.S. National Bureau of Standards. Later on this computer was replaced by an engineered version, while Pilot ACE was bequeathed to the British Science Museum for exhibition. An expanded type ACE has been completed recently. The use of cathode-ray tubes as store element was pioneered by F. C. Williams of the Manchester University in his Mark I. An expanded type (Mark II) and an experimental transistor machine followed soon. Like EDSAC II, Mark II has a magnetic core storage.

From all these experimental machines several commercial versions were derived. It must be noticed however, that in Great Britain the total number of computers installed or on order is only about three hundred (1958). This number is small, compared with that in the U.S., but on the European computer market, Great Britain is undoubtedly leading.

Readers of this journal receive yearly a list of information about what is available in the computer field. The Computer Directory and Buyers' Guide embraces only the U.S. products (and those overseas products, represented in the U.S.). Details about British commercial computers are given in some journals and other publications related to the field, but so far as we know, a complete description has never been published in the U.S.

It is the purpose of this report to do so. Most of the information was assembled by the author as a member of a course on digital computers, organized at the end of 1957 by the British Council, and as a visitor to the Electronic Computer Exhibition, held at London (Olympia) in November-December 1958.

The author is indebted to the direction of the Gevaert Photo-Producten N.V., Mortsel, Belgium, who made this study possible. He wishes also to thank the manufacturers who checked the information given.

British Computers and Manufacturers

THE BRITISH TABULATING MACHINE CO., LTD, Hyde Park, London.

The company has been marketing Hollerith punched card equipment (80 column cards) for nearly fifty years. Allied with International Business Machines Corporation, the company became independent about ten years ago. Recently BTM has entered into association with the Laboratory for Electronics, Boston, Mass. and with the General Electric Company, Kingsway, London. A proposed merger between BTM and Powers-Samas should be finalized in 1959.

Since 1951 a series of electronic calculating punches, the most recent being the Hollerith type 555 electronic calculator, has been developed. About fifteen 555's have been delivered so far. In 1953 an electronic

computer for scientific calculations, Hec 2, was introduced. To satisfy the needs of business and industry Hec 4, now called Hec type 1201, has been constructed. A similar computer, but with expanded storage capacity, is the Hec type 1202. About fifty Hec's have been installed or are on order. Data processing systems also have been designed. The first, type 1400, will be completed in the near future.

— Hollerith 555
Controlled by panels. Operation mode: serial parallel. Number base: binary decimal. Word length: 10 decimals plus sign. Program: 150 steps, 3 address instructions. Extraction of square roots automatic.
Store: magnetic drum. Capacity: 105 words, 5 tracks of 21 words and 1 additional track as input/output buffer store. Speed: 3,000 rpm. Average access time: 10 ms.
Input/output: 80 column cards (100 cards per min).
Operation speeds (average): 1 ms for addition and subtraction, 18 ms for multiplication and 55 ms for division.
Power consumption: about 8 kVA. Floor area occupied: 40 sq. ft. Price: approximately £ 25,000.

— Hec 1201 & 1202
Operation mode: serial. Number base: binary. Word length: 40 bits (including sign). Order code: 1+1 address type (1 word).
Store: magnetic drum. Capacity: 1,024 words (Hec 1201) or 4,096 words (Hec 1202). Speed: 3,000 rpm. Average access time: 10 ms.
Input: card reading unit of a tabulator (100 cards per min, alphanumeric). Output: printing unit of the tabulator (100 alphanumeric lines of 100 char. per min) or gang punch (100 cards per min). 80 column cards are used. Sterling conversion is automatic.
Operation speeds: 2.5 ms for addition and subtraction (including instruction), 20 ms for multiplication (average) and 50 ms for division (maximum).
Power consumption: 11 kVA. Floor area occupied: 57 sq. ft. Price (Hec 1201): £ 33,000.

— Type 1400
Operation mode: serial parallel. Number base: binary decimal. Word length: 11 digits plus parity digit. Word transfer time: 16 microsec. Order code: 3 address type (1 word).
Immediate access store: magnetic cores. Capacity: 100 words. Backing store: magnetic drum. Capacity: 11,250 words. Speed: 6,000 rpm. Average access time: 5 ms. A Decca twin magnetic tape unit may be added.
Input: 80 column punched cards (600 cards per min). Output: high speed printer (400 lines per min).
Basic order time of the arithmetic unit is 0.016 ms. Multiplication speed is up to 0.850 ms. A multiply divide order requires up to 1.65 ms.

Price: expected to be from £ 100,000 to £ 150,000.
Later machines will include: an immediate access store of up to 1,000 words, up to 5 additional drums, additional magnetic tape units, additional card readers and on-line printers, punched card output, paper tape readers and punches.

ELLIOTT BROTHERS LTD, Comp. Mach. Div., Borehamwood, Hertfordsh.

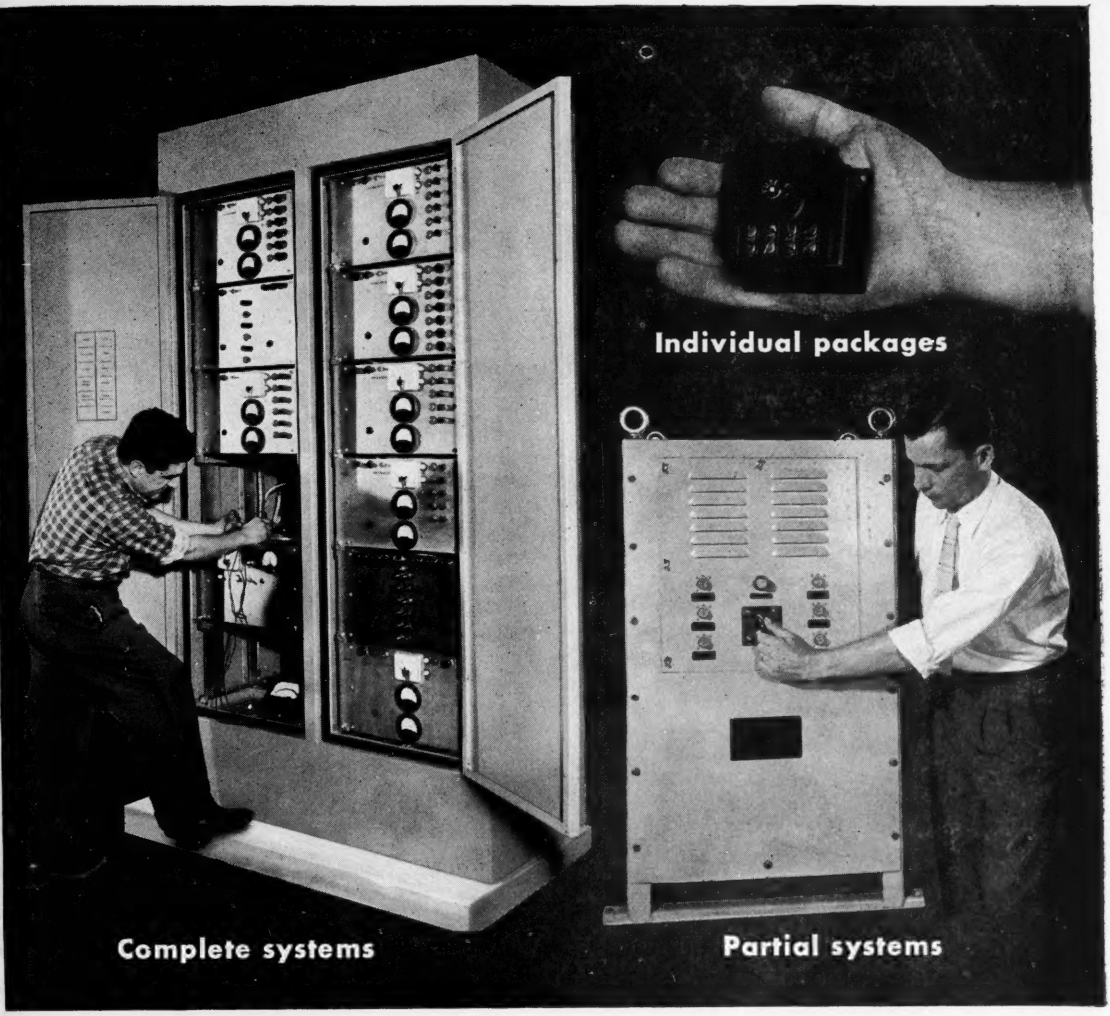
Apart of manufacturing analogue computers (like G-PAC), the company has developed a series of digital computers. A nickel delay line store machine, Nicholas, was completed in 1950 and is still in operation for internal work. The commercially available computers were developed from the Elliott 401 which was completed in 1954 and is now operating at the Rothamsted Agricultural Research Station. The production version, Elliott 402, was one of the first British machines in which an extensive use was made of plug-in units (about 95% of the electronic equipment). Two other scientific computers, Elliott 403 and 404, followed soon and a data processing machine, Elliott 405, was designed. The object of the 405 is to be a flexible system whose different possible arrangements can evolve, as requirements dictate and as technical advances allow. Several have been completed and a sales agreement was concluded with the National Cash Register Co. A transistorized small scale magnetic core store computer, National-Elliott 802, has been completed recently. It was designed for business, scientific, process control and data logging applications. About 45 Elliott computers have been delivered or are on order.

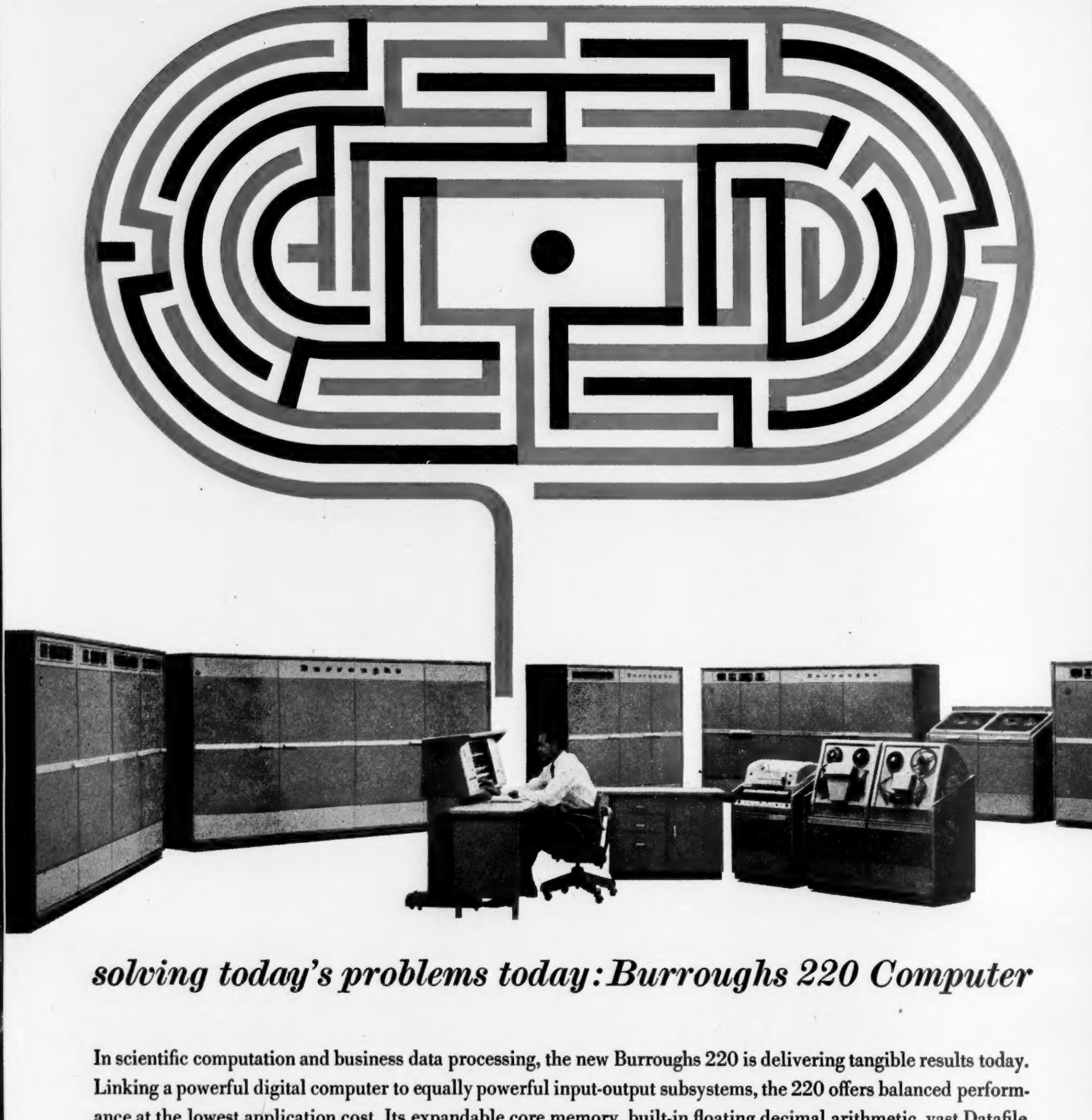
— Elliott 402
Operation mode: serial. Number base: binary. Word length: 32 bits (including sign digit). Point working: fixed (402E) or fixed and floating (402F). Instructions: 1+1 address code (1 word). Addresses can be modified by use of seven B-lines. Order code and operating speeds are the same for both fixed and floating point calculation. Immediate access store: 17 single word nickel delay lines (including accumulator). Main store: magnetic drum. Capacity: 4,976 words. Speed: 4,600 rpm. Mean access time: about 6.6 ms. Two magnetic film units can be connected (each reel holds 281,600 words).
Input: 80 column punched cards with photo-electric reader (400 cards per min) or 5 hole paper tape (Ferranti: 180 char. per sec). Output: 5 hole paper tape (25 char. per sec). Standard Hollerith or IBM card readers may be connected.

Operation speeds (including time tak[en] for decoding of order): 0.204 ms fo[r] addition and subtraction, 3.376 ms fo[r] multiplication and division.
Power consumption: 7 kVA (402E) an[d] 11 kVA (402F). Floor area occupied about 44 sq. ft. Minimum price: £ 25,00[0] (402E) and £ 35,000 (402F), magneti[c] film units not included.

— National-Elliott 405
Operation mode: serial. Number bas[e:] binary. Word length: 32 bits (includin[g] sign digit). Instructions: 1 address typ[e] (1 halfword).
Quick access store: nickel delay lin[es.] Standard capacity: 512 words. Avera[ge] access time: 0.8 ms (3 words are imm[e]diate access). Main storage: magneti[c] drum or magnetic disc. Capacity: r[e]spectively 4,096 and 16,384 words. Tran[s]fer: in blocks of 64 words. Averag[e] access time for a block: 19.5 ms (drum[)] and 26 ms (disc). During transfer th[e] machine is capable of carrying out oth[er] work. Magnetic film units are optiona[l.] The films are 35 mm wide and 1,000 fe[et] long. Their capacity is 281,600 word[s.] The film units are connected with th[e] computer over control units with a quic[k] access buffer of 64 words. Transfer [is] done in blocks of 64 words. 1 to 4 co[n]trol units can be connected and each un[it] can control 1 to 4 magnetic film units.
Input: 80 column punched cards (40[0] cards per min) or 5 hole paper tape (Fe[r]ranti: 180 char. per sec). Up to 3 cha[n]nels may be used. Output: 5 hole pape[r] tape (25 or 60 char. per sec), magneti[c] film (300 char. per sec) or electric typ[e]writer (10 char. per sec). Output b[y] punched cards is available. Up to 4 ou[t]put channels may be used. Addition o[f] high speed paper tape reader (500 o[r] 1,000 char. per sec) and punch (Creed, 300 char. per sec) has been develope[d.] Off-line output from the magnetic film is on paper tape or high speed printers.
Operation speeds (including instruction) 0.153 ms for addition and subtraction, 3[.] ms for multiplication and division.
Power consumption: 15 to 35 kVA. Th[e] floor room required for a typical insta[l]lation is about 1,200 sq. ft. Price £ 30,000 and up.

— National-Elliott 802.
Operation mode: serial. Number bas[e:] binary. Word length: 33 bits (includin[g] sign digit). Instructions: 1 address typ[e] (1 halfword).
Store: magnetic cores. Capacity: 1,02[4] words (4 words of fixed orders). An[y] location may be used as B-modifier.
Input: 5 hole punched tape (Ferranti up to 170 char. per sec). Output: 5 hol[e] punched tape (25 char. per sec), subs[e]quently interpreted by typewriter (1[0] char. per sec). A punched card reade[r,] additional tape readers and punch, ma[n]ual keyboard input, analogue and digit[al] recording mechanisms are optional.
Operation speeds (including instruction) 0.612 ms for addition and subtractio[n,] 21.4 ms for multiplication and division.
Power consumption: 2 kVA. Floor are[a] occupied: 40 sq. ft. Price (basic ma[]chine): £ 20,000.


Individual packages
Complete systems
Partial systems



E.M.I. ELECTRONICS LTD,
Hayes, Middlesex.

The E.M.I. Electronics Ltd, controlled by Electric & Musical Industries Ltd, manufactures electronic instruments, photomultipliers, nuclear health instruments, electronic enlargers, industrial television equipment, machine tool control systems, computers, etc.

Both, the analogue and the digital computer field are covered. The latest development in the analogue computer field is EMIAC. A high speed digital computer, Emidec 1100, employing magnetic cores and transistors, has been developed. With its associated input and output equipment and high speed magnetic tape units it provides a fully comprehensive and flexible data processing system. The first of the series has been completed in 1958. A new large high speed data processing system, Emidec 2400, is being developed in conjunction with the National Research Development Corporation.

—Emidec 1100
Operation mode: parallel. Internal number system: binary. Word length: 36 bits. Instructions: 2 address type (1 word).
Computing store: magnetic cores. Capacity: 1,024 words. Main store: magnetic drums. Capacity: 8,192 or 16,384 words each. Access time: 10 ms. Any reasonable number of drums may be used. Up to 16 EMI magnetic tape decks may be added. Read/write speed: 20,000 char. per sec.
Input: 80 column punched cards (Elliott: 400 cards per min) or 5 hole paper tape (Ferranti: 350 char. per sec). Output: 5 hole paper tape (25 char. per sec), printer (100 lines of 100 char. per min) high speed printer (Samastronic: 300 lines of 140 char. per min) or teleprinter/electric typewriter. Output by punched cards can be provided. Each input and output unit has magnetic core buffer store. High speed printers can be supplied to work off-line from magnetic tape. Alphanumeric, decimal and sterling conversion is automatic.
Operation speeds (including B-line modifications and access time to the immediate access store): 0.125 ms for addition and subtraction, 1.120 ms for multiplication and division.
Power consumption: 5 to 15 kVA. Room accommodation requires 600 to 1,200 sq. ft. Price: £ 100,000 to £ 200,000 for an average installation.

—Emidec 2400
Operation mode: parallel. Both binary and alphanumeric data are processed. All arithmetic operations are performed in binary. Binary word length: 36 bits. Instruction code: 2 address type (1 word). Conversion orders to and from binary are provided. Alphanumeric word length: variable, up to 15 units of 6 characters (36 bits) per unit.
High speed store: diode-capacitors. Capacity: 64 words, which can be used as B-lines. Cycle time: 4 microsec. Computing store: magnetic cores. Capacity: 4,096 words. Cycle time: 15 microsec. Magnetic core storage is used in off-line peripheral units and fast start-stop one-inch magnetic tape (20 units) to integrate the system. Four-inch wide magnetic tape (5 units) is used for bulk storage. Both tapes operate at 20,000 char. per sec.
On-line input: 65 or 80 column punched cards (300 cards per min), 5 or 7 hole paper tape (300 char. per sec) or both forms of magnetic tape. Off-line input: keyboards to magnetic tape via input units (up to 112 keyboards per unit) and 65 or 80 column punched cards or paper tape to magnetic tape converters.
On-line output: punched cards (100 cards per min), paper tape (30 char. per sec), line printer (300 lines of 140 char. per min) or both forms of magnetic tape. Off-line output: punched cards and line printer (eventually a xerographic printer, 3,000 lines per min) from magnetic tape and existing tabulators from punched cards.
The central computer operates asynchronously. Most instructions are set up and executed in 25 to 40 microsec.
Average consumption: 20 kVA (exclusive of tape unit motors). Floor area: about 200 sq. feet and up. Price: not yet available.

THE ENGLISH ELECTRIC CO. LTD, Kidsgrove, Stoke-on-Trent, Staffs.

In conjunction with the N.P.L. (National Physical Laboratory), the Nelson Research Laboratories of the English Electric Co. Ltd designed and developed a commercial computer, universally known as DEUCE (Digital Electronic Universal Computing Engine). This machine was based on the original Pilot Model ACE of the N.P.L. One Deuce has been installed at the N.P.L. Three are employed by the E.E.C. itself, for their own research as well as for hire services. About twenty have been constructed for outside establishments.

Besides this, the firm has developed a system of logical circuits in the form of standard units which, when integrated and fitted with the appropriate control circuits, can be combined to a large range of special purpose computers.

— Deuce
Operation mode: serial. Number base: binary. Word length: 32 bits (including sign digit). Special facilities incorporated for double-length arithmetic. Instructions: 2+1 address type (1 word).
Short access time store: mercury delay lines. Capacity: 402 words. Composition: 4 short lines of one word (access time immediate), 3 short lines of 2 words (16 microsec average), 2 short lines of 4 words (48 microsec average) and 12 long lines of 32 words (496 microsec average). Auxiliary store: magnetic drum. Capacity: 8,192 words (256 tracks of 32 words). Speed: 6,510 rpm. Access to a specified track is given by moveable sets of heads. Transfer is done in blocks of 32 words (one track). Transfer time amounts to 15 ms if the head assembly is not required to move and to an additional 35 ms if it has first to be moved, but computation may proceed in the meantime. The storage capacity can be extended by connecting up to 4 Decca twin magnetic tape units.
Input: 80 column punched cards (BTM Hollerith Card Reader: 200 cards per min). Output: 80 column punched cards (BTM Hollerith Punch: 100 cards per min). Both can be replaced by IBM equipment. Input and output is operating on 64 columns of the cards. High speed 5 or 7 hole paper tape input (850 char. per sec) and 7 hole paper tape output (30 char. per sec) may be fitted.
Operation speeds (including instruction): 0.064 ms for addition and subtraction, 2 ms for multiplication and division.
Power consumption: 10 kVA and up.
Floor area (minimum): 92 sq. ft.
Price: approximately £ 56,000, spares included but without magnetic tape units and paper tape equipment.
The machine described, Deuce Mk. I, is mainly intended for scientific and technological applications. A later version, Deuce Mk. II (Mk. IIA provides seven extra, long delay lines), is intended to form the central unit of data processing systems. Input and output of this machine is operating on the full capacity of the punched cards.

FERRANTI LTD.
Hollinwood, Lancashire.

After Professor F. C. Williams and his colleagues at Manchester University had designed and completed two experimental computers, with cathode ray tube storage, Ferrite Ltd replaced those in 1951 by an engineering version, the Ferranti Mark I Computer. A copy of this was installed at Toronto University (FERUT) and in 1953 a series of commercial versions was started, the Ferranti Mark 1* Computers. Seven of this type were made and in 1956, the construction of a medium sized machine, the Ferranti Pegasus Computer, was begun. About twenty of this multi-purpose machine have been installed, and it has been expanded to a data processing system. Furthermore, the first commercial version of a large scientific computer, the experimental Manchester University Mark II, was completed and delivered to this University in 1957. This computer was named Ferranti Mercury and about sixteen have been installed or are on order.

[To be continued]

Readers' and Editor's Forum

[Continued from page 6]

necessary philosophy. Here then, we have an example of where the scientist met an impasse, yet took upon himself the responsibility of overcoming it, even though it meant invading another field of knowledge.

The same type of thing, I believe, will be repeated at the present time in regard to the destructive power of the atom; if men in other fields do not provide the necessary safeguards (for instance, international governmental affairs), then scientists will again leave their own fields and seek to provide whatever influence is necessary to see that the atom be used for peaceful purposes only.

Russian and American scientists seem to work together with some degree of harmony within the field of science. If together they would flatly refuse to cooperate with their governments in case of war, then the governments might be helpless to undertake a war. In this case the scientist would have the final say.

It seems to me that it is the broad scientific views of many Russian scientists that are beginning to soften the governmental agencies in Russia. The same should be true of American scientists. Their influence upon our government is likely to be felt more in the future than it has in the past.

The entrance of scientists into governmental affairs is a natural consequence of the great influence science is exerting upon society.

The great advantage that America has over Russia is in free interplay and coordination within the different elements of society, while in Russia, such interplay is strictly controlled by a few governmental leaders.

Several of the editorial articles printed in your magazine reveal a fresh and broad outlook upon some of the problems connected with science and world affairs, a type of outlook that is seldom found elsewhere. It is for this reason that I am writing.

II. From the Editor

Scientists, when they reach out into a new field, bring considerable advantages:

1) a fresh viewpoint;
2) a respect for facts, and a strong desire to find out the true facts;
3) habits of using logical reasoning and the laws of probability;
4) a capacity to ask penetrating questions.

The present importance of operations research and management science, often making use of automatic computers, springs from the entry of trained scientists into new, practical fields — fields in management, business, industry, and war.

There is now a big new field for computer scientists to reach out into. This is the field of sensible activities to prevent millions of human deaths from the combination of computing devices, ballistic missiles, and nuclear warheads. The only substantial reason that the United States and the Soviet Union are pouring money into ICBM's and IRBM's is that they can carry nuclear warheads. In fact, the accuracy of an ICBM or an IRBM is not sufficient for a chemical warhead like TNT to make military sense.

Whether or not a computer scientist reaches out into this new field is mainly a matter of his attitude. This depends on the awakening of thought, reflection, and decision.

And let no one believe that millions of Russians will be dead and no Americans, or that millions of Americans will be dead and no Russians. If there is any positive conclusion to be drawn from the mounting supplies of nuclear bombs, ballistic missiles, and guidance systems (if they are ever used), it is this: BOTH millions of Americans dead AND millions of Russians dead, including nearly all inhabitants of New York, Chicago, Los Angeles, Washington, Moscow, Leningrad, Kiev, Vladivostok, etc.

And if this is a horrible prospect to you, then think, and ask questions, and discuss and reason and argue. Inquire, for example, why much less than one thousandth of military budgets is being spent on scientific research for peace, on finding out and reaching for the conditions for a stable and lasting peace. Inquire for example how inspection of military computing systems under an international disarmament agreement would be carried out. And more besides. Don't cooperate with horror, by your silence.

INTENSIVE SUMMER COURSES

The University of Michigan, Ann Arbor, Mich., has scheduled a number of intensive summer courses for certain periods in the summer of 1959. Of these eight relate particularly to the computer field:

Automatic Control:	June 15 — 24
Introduction to Standard Methods of Numerical Analysis:	June 15 — 26
Introduction to Digital Computer Engineering:	June 29 — July 10
Advanced Theory of the Logical Design of Digital Computers:	June 29 — July 10
Advanced Numerical Analysis:	June 29 — July 10
Computer Programming and Artificial Intelligence:	June 29 — July 10
Foundations and Tools of Operations Research and the Management Sciences:	June 29 — July 10
Random Processes:	Sept. 7 — 11

CALENDAR OF COMING EVENTS

April 2-4: Joint Meeting — Institute of Mathematical Statistics (Central Region) and Association for Computing Machinery, Case Institute of Technology, Cleveland, Ohio.

May 11-13: Joint Automation Conference, Chicago, Ill.

May 14-15: Fourth Annual Electronic Data Processing Conference, University of Alabama, University, Alabama.

May 14-15: Operations Research Society of America National Meeting, Shoreham Hotel, Washington, D.C.

June 15-20: International Conference on Information Processing, Paris, France.

June 22-25: British Computer Society 1st Annual Conference, Cambridge, England.

Sept. 1-3: Association for Computing Machinery Annual Meeting, Mass. Inst. of Technology, Cambridge, Mass.

NEW PATENTS

RAYMOND R. SKOLNICK
Reg. Patent Agent
Ford Inst. Co., Div. of Sperry Rand Corp.
Long Island City 1, New York

THE following is a compilation of patents pertaining to computers and associated equipment from the "Official Gazette of the United States Patent Office," dates of issue as indicated. Each entry consists of: patent number / inventor(s) / assignee / invention. Printed copies of patents may be obtained from the U.S. Commissioner of Patents, Washington 25, D.C., at a cost of 25 cents each.

July 22, 1958: 2,844,308 / Roger R. Dussine, Paris, Fr. / Societe d'Electronique et d'Automatisme, a Corp. of Fr. / Circuits for the addition and subtraction of numbers.

2,844,310 / John Robert Cartwright, Letchworth, Eng. / — / A data column shifting device.

2,844,312 / James M. McCampbell, San Francisco, Calif. / U.S.A. as represented by the Sec. of the Navy / A radiation intensity dosage analogue computer.

July 29, 1958: 2,845,219 / Gerard J. R. Piel, Paris, Fr. / Societe d'Electronique et d'Automatisme, Paris, Fr. / A scale-conversion apparatus for converting a numerical quantity expressed in a binary scale of notation to the corresponding expression of said quantity in the denary scale of notation.

2,845,220 / Lowell S. Bensky and Linder C. Hobbs, Haddonfield, N.J. / Radio Corporation of America, a corporation of Delaware / An electronic comparator.

2,845,222 / Joseph F. Genna and Robert E. Stalcup, Indianapolis, Ind. / U.S.A. as represented by the Sec. of the Navy / A high speed parallel type binary electronic adder.

2,845,597 / George D. Perkins, Duarte, Calif. / Consolidated Electrodynamics Corp., Pasadena, Calif. / A system for digitizing analog signals.

2,845,609 / Edward A. Neuman, Teddington, Donald W. Davies, Southsea, and David O. Clayden, Hanwell, London, Eng. / National Research Development Corp., London, Eng. / A method of recording digital information.

2,845,610 / Warren A. Cornell, Murray Hill, and John H. McGuignan, New Providence, N.J., and Orlando J. Murphy, New York, N.Y. / Bell Telephone Laboratories, Inc., New York, N.Y. / A magnetic data storage system.

2,845,611 / Frederic C. Williams, Oakhurst, Romiley, Eng. / National Research Development Corp., London, Eng. / A digital storage system.

August 5, 1958: 2,846,141 / Roy Bailey, Woolhampton, and Gerhard Liebmann, Aldermaston, Eng. / Sunvic Controls Limited, London, Eng. / An electrical analogue computing apparatus.

2,846,593 / Eugene A. Sands, Mount Kisco, N.Y. / —— / A logical computing element.

August 12, 1958: 2,847,161 / Alexander Greenfield, Detroit, Mich. / Bendix Aviation Corp., Detroit, Mich. / A counting circuit.

2,847,568 / Julian A. Saucedo, Covina, Calif. / Hoffman Electronics Corp., a Corp. of Calif. / A distance digital display circuit arrangement.

2,847,615 / Douglas C. Engelbart, Oakland, Calif. / Digital Techniques, Inc., Berkeley, Calif. / A memory device.

2,847,658 / Francis V. Adams, Endicott, N.Y. / International Business Machines Corp., New York, N.Y. / A drum storage look-up device.

August 19, 1958: 2,848,160 / Ben Bide man, Cedar Rapids, Iowa / Colli Radio Co., Cedar Rapids, Iowa / trigonometric computing apparatus.

2,848,161 / Harry J. Woll, Audubo N.J. / R.C.A., a Corp. of Del. / A analogue multiplication device.

2,848,532 / Robert L. Weida, Elmhur N.Y. / Underwood Corp., New Yo N.Y. / A data processor.

2,848,605 / Saul Kuchinsky, Phoenixvill Pa. / Burroughs Corp., Detroit, Mic / An analogue-to-digital conversi using cathode ray sampler to control cathode ray coder.

2,848,670 / Leroy U. S. Kelling and Law rence R. Peaslee, Schenectady, N.Y. General Electric Co., a Corp. of Ne York / An Automatic programmin servomotor control system.

2,848,709 / Curtis M. Jansky, New Yor and Arthur W. Vodak, Garden Cit N.Y. / Sperry Rand Corp., a Corp. Delaware / A digital data storage ci cuit.

August 26, 1958: 2,849,181 / Jules Le mann, Trenton, N.J. / R.C.A., a Cor of Del. / A time-division computin device.

2,849,183 / John H. Kuck, Silver Sprin Md. / U.S.A. as represented by the Se retary of the Navy / An analyzer fo plotting the probability of the occu rence of a given amplitude in an ele trical wave.

2,849,184 / Arden H. Fredrick, Mou Kisco, and John W. Gray, Pleasan ville, N.Y. / General Precision Lab Inc., a Corp. of N.Y. / A navigationa system wind computer.

2,849,704 / Glyn A. Neff, Pasadena, Cali / Consolidated Electrodynamics Corp Pasadena, Calif. / A data processin system.

2,849,705 / Munro K. Haynes, Poug keepsie, N.Y. / I.B.M. Corp., Ne York, N.Y. / A multidimensional hig speed magnetic element memory Ma trix.

2,849,706 / Charles L. Hamblin, Londo Eng. / General Electric Co., Lim., Lo don, Eng. / An electronic circuit fo deriving a voltage proportional to th logarithms of the magnitude of a vari able quantity.

Sept. 2, 1958: 2,850,236 / David Schaefer, Wash., D.C., and Donald Scorgie, Pittsburgh, Pa. / U.S.A. represented by the Sec. of the Navy A polarity sensitive analogue divide

2,850,237 / Gordon C. Irwin, Fair Have N.J. / Bell Telephone Lab., Inc., Ne York, N.Y. / A number scanning ci cuit.

2,850,667 / Frederic C. Williams, Romiley, Eng. / National Research Development Corp., London, Eng. / An apparatus for storing binary digits.

2,850,719 / Richard J. LaManna, Orange, N.J. / Monroe Calculating Machine Co., Orange, N.J. / A data entering means for storage devices.

Sept. 9, 1958: 2,851,219 / Luther W. Hussey, Sparta, N.J. / Bell Telephone Lab., Inc., New York, N.Y. / A serial adder for adding successive pairs of binary digits.

2,851,220 / Richard E. Kimes, Concord, Calif. / Beckman Instruments, Inc., South Pasadena, Calif. / A transistor counting circuit for counting electric pulses.

Sept. 16, 1958: 2,852,191 / Howard A. Lazarus, Brooklyn, N.Y. / Reeves Instrument Corp., New York, N.Y. / A circuit for computing the cosine of the angular position of a shaft.

2,852,764 / Donald McL. Frothingham, Darien, Conn. / Barnes Engineering Co., Stamford, Conn. / A data conversion system.

Sept. 23, 1958: 2,853,234 / Roger R. Dussine, Paris, Fr. / Societe d'Electronique et d'Automatisme, Courbevoie, Fr. / An electronic digital adder-subtractor computer device.

2,853,235 / John F. Brinster, Homer M. Hill, Jr., and Erwin Donath, Princeton, N.J. / Applied Science Corp. of Princeton, Princeton, N.J. / A binary digit multiplier circuit for use in digital computers.

2,853,238 / Robert R. Johnson, Pasadena, Calif. / Hughes Aircraft Co., Culver City, Calif. / A binary-coded flip-flop counter.

2,853,357 / Alfred W. Barber, Flushing, N.Y. / John T. Potter, Locust Valley, N.Y. / A pulse packing system for magnetic recording of binary coded information.

2,853,697 / Sheldon D. Silliman, Forest Hills, and Willard A. Derr, Pittsburgh, Pa. / Westinghouse Electric Corp., East Pittsburgh, Pa. / A logic-element decimal register.

2,853,699 / Stephen J. O'Neil, Lexington, Mass. / U.S.A. as represented by the Sec. of the Air Force / A digital-to-analogue shaft position transducer.

Sept. 30, 1958: 2,854,191 / Gordon Raisbeck, Basking Ridge, N.J. / Bell Telephone Lab., Inc., New York, N.Y. / An apparatus for computing the correlation of two signals.

2,854,518 / William W. Pharis, Rochester, New York / General Dynamics Corp., Rochester, N.Y. / A digit adding selector.

2,854,573 / James E. Fernekees, Wappingers Falls, N.Y. / International Business Machines Corp., New York, N.Y. / An electronic storage device employing a phantastion with arrangement for gating synchronizing pulses.

WHO'S WHO IN THE COMPUTER FIELD

(Supplement)

A full entry in the "Who's Who in the Computer Field" consists of: name / title, organization, address / interests (the capital letters of the abbreviations are the initial letters of Applications, Business, Construction, Design, Electronics, Logic, Mathematics, Programming, Sales) / year of birth, college or last school (background), year of entering the computer field, occupation / other information such as distinctions, publications, etc. An absence of information is indicated by - (hyphen). Other abbreviations are used which may be easily guessed like those in the telephone book.

Every now and then a group of completed Who's Who entry forms come in to us together from a single organization. This is a considerable help to a compiler, and we thank the people who are kind enough to arrange this. In such cases, the organization and the address are represented by . . . (three dots).

Following are several sets of such Who's Who entries.

Bendix Aviation Corp., Systems Division, 3300 Plymouth Rd., Ann Arbor, Mich.

Becher, William D / Staff Engr, . . . / DL / '29, Tri-State Coll, U of Mich, '58, engr / Member of IRE

Buzzard, Robert D / Engr, . . . / A / '26, MIT, San Diego State Coll, '53

Dye, Robert H / Staff Engr, . . . / AL / '29, U of Mich, '53 / Tau Beta Pi, Eta Kappa Nu, co-author of UMRI Tech Rpt #79

Gordon, David George / Staff Engr, . . . / DL / '34, Case Inst of Tech, '58, engr

Gildner, Gilbert G / Staff Engr, . . . / ADL / '32, Mich Coll of Mining & Tech, '57, elecncs engr (data procg)

Johnston, George A / . . . / AD / '31, Nwn U, '56, engr

Collins, Arthur B / . . . / ACEDL / '29, Mich State U, '53

Kloosterman, James L / Staff Engr, . . . / ALP / '33, Western Mich U, '55

Loughray, Jr, Bruce / Data Procg Proj Engr, . . . / ACEDL / '29, Univ of Conn, '52

Potter, William H / Engr, . . . / EMDL / '22, Ind Univ, U of Mich, '52

Smith, James F / . . . / MP / '29, Sou Methodist Univ, '58

Van Valkenburg, E S / Head, Data Pro & Display Dept, . . . / ACDL / '2 U of Mich, '47, engr

Computer Control Co., 2251 Barry Av Los Angeles 64, Calif.

Alexander, James C / Head of Auto Prgmg, . . . / AMP / '30, Univ Wash, '55, Sr Prgmr

Arnold, Dorothy E / Head, WLA Ma Gp, . . . / CDMPS / '22, Univ Ariz, '53, mathn

Baugh, Harold W / Sr Proj Engr, . / AELM / '24, CIT, '51, elecnc en

Baumer, William E / Asst Engr, . . . CDEL / '29, UCLA, '56, engr

Brathwaite, Louis K / Analyst, . . . AMP / '27, NYU Grad Sch, '54, math

Brinckerhoff, Frank E / Prgmr, . . . AMP / '32, Univ So Cal, '56, mathn

Coker, Louise / Mathn Prgmr, . . . MP / —, UCLA, '55, mathn

Dyer, James / Analyst, . . . / MP / '2 UCLA, '52, mathn

Fairbrother, Edward M / Prgmr, . . . MP / '29, UCLA, '56, mathn

Frieden, Howard / Mathn-Prgmr, . . / LMP / '35, Univ of Chi, '54, math

Giese, Gerald J / Prgmr, . . . / AMP '34, Ariz State at Tempe, '56, mathn

Holden, Louise / Prgmr, . . . / P / '0 Nwn Univ, Evanston, Ill, '54, prgm

Holguin, Raul E / Prgmr, . . . / MP / '2 UCLA, '53, prgmr

Kampe, Elza M / Prgmr, . . . / MP '16, Univ of Mich, '54, mathn

Kosinski, Walter J / Math Sales Mg . . . / ABCDELMPS / '31, Univ Conn, UCLA, '54, mathn

McMillan, Malcolm C / Analyst, . . . LMP / '27, UCLA, '55, mathn

Nickols, Alexander / Prgmr, . . . / AM / '32, UCLA, '54, mathn

Rawl, Wilfred E / Mathn, . . . / MP '27, Ind Univ, USC, UCLA, '52, math

Ritland, Lloyd O / Head, CCC Math G . . . / MP / '06, UCLA, '56, prgmr

Skidmore, John W / Prgmr, . . . / M / '05, Case Inst of Tech, '57, mathn

Spargur, Janet L / Compr Operator, . . / ALMP / '27, LA Jr Coll, '56, comp operator

Sprong, D C / Head, Engrg Dept, . . / CDEL / '09, UCLA, '48, engr

Stockmal, Frank / Head, Math Dept, . . / AMP / '21, Univ of Rochester, '5 mathn

Wesley, Louis W / Compr Analyst, . . / MP / '20, Univ of Minn, '42, math

Wiegert, Samuel C / Prgmr, . . . MP / '29, Iowa St Teach Coll, '5 mathn

Remington Rand Univac, Div. of Sper Rand Corp., Univac Park, St. Paul 1 Minn.

Callahan, James I / Prod Planner . . .

ABDPS / '29, Wm & Mary, Univ of Ill, '56, prod planner

Clamons, Eric H / Mgr, New Products . . . / ABMP / '19, Univ of Minn, '48, mech engr, mathn

Cramer, John B / Mathn, . . . / ABP / '23, Univ of Colo, '50, mathn

Dyal, J O / Head, Prod Proposal Sec . . . / planning computer products / '25, Univ of N C, '49, physicist

Ericksen, Gerald L / Mathn, . . . / A / '31, Univ of Minn (M.A.), '54, prod planning

Higgins, Jr., Leo J (Aplcns Analyst, . . . / ABP / '24, Univ of Wisc (BBA '51), '56, accountant (prior to computers) / Phi Beta Kappa, Beta Gamma Sigma

Hildreth, Dalton L / Aplns Analyst, . . . / ABP / '21, Univ of Ill, '56, accountant

Holston, Alfred A / Systems Analyst, . . . / AP, air traffic contr systems / '20, N Tex State Coll, '56, analyst

Jarvis, Donald T / Supvr, Systems Requirements Sec, New Prod Dept, . . . / ABLMP / '22, Univ of Minn, '56, mathn

Keefer, David E / Supvr, New Prod Dept . . . / ABD / '23, Univ of Va, '49, prod planning

Lunger, George F / Staff Consultant, . . . / ABDELMP / '18, Univ of Mich, '56, mathl statn / "Theory of Queens" publ by Univac Div; co-author of two papers on lake trout fisheries

Rennacker, Harvey E / Mgr, Planning Support Dept, . . . / prod planning of new prod & modifns to current products / '23, US Naval Acad, '54, elecl engr

Sampson, Lewis H / Aplns Analyst, . . . / ABDELMP / '27, Univ of Minn, '56, aplns analyst

The Datics Corporation, 6000 Camp Bowie Blvd., Fort Worth, Texas

Austin, Kenneth L / Pres, . . . / ABDELMPS / '25, Univ of Okla, '50, mgt of compr svc orgn

Ergle, John L / Datatician, . . . / A / '29, Georgia Tech, '55, chem engr

Marotta, Anthony F / Dir of Data Proc Svcs, . . . / ABMP / '30, Texas Christian Univ, '56, Dir, Data Proc Svcs / Journal of Petroleum Technology, Oil & Gas Journal, Ninth Oil Recovery Conference at Texas A&M

McIntire, Robert L / Vice Pres, . . . / AP / '24, Purdue & Iowa State, '50, registered engr / 20 patents in field of engrg and papers in tech journals

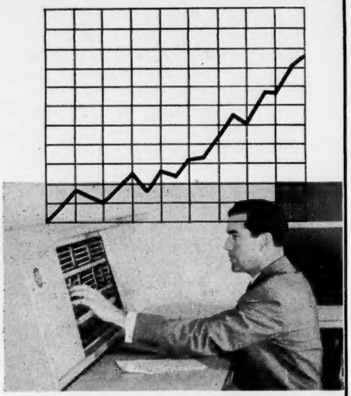
Medwedeff, Marion C / Datatician, . . . / APS, engrg / '29, Lamar State Coll of Tech, '56, compr prgmr

Roberts, Cloyd M / Ch of Opns, . . . / A / '27, Texas A&M, '56, ch of opns

Schneider, John C / Datatician, . . . / MPS, engrg, stat analysis / '28, St. Edward's Univ, '53, data proc engr

Titt, Mrs LaVeta / Statistician, . . . / M, statistics, engrg / '06, Univ of Chic & Univ of Md, '53, mathl statn

Vinson, Jon A / Datatician, . . . / AMPS, engrg probs / '29, Centenary Coll of La, '55, mathn



General Electric Company, Evendale Computations Building 305, Cincinnati 15, Ohio

Allison, M H / Mgr, Automatic Test Data Procg Unit, . . . / P / '26, Ohio State Univ, '57, —

Bailey, Barbara Wells / Numerical Analyst, . . . / LP / '32, Goucher College (B.A. Physics), '54, prgmr

Baker, J M / Automatic Test Data Redn Analyst, . . . / P, Testing Area of Data Reduction / '26, Hanover College, '55 —

Banan, Frederick B / Mgr, Compr Techniques Devt, . . . / P. Opernl Systems / '14, Worcester Poly Inst, '56, —

Bartlett, Jan C / Systems Devt Analyst, . . . LMP, Systems / '32, Univ of Cincinnati, '56, 704 systems devt

Booher, W L / Numerical Analyst, . . . / ALMP / '28, Purdue Univ, '58 —

Campbell, Donald J / Math Compns Analyst, . . . / LMP / '33, Univ of Mich, '56, prgmr

Caplan, L N / Bus Systems Analyst, . . . / ABLMP / '30, Carnegie Tech, '55, bus systems analyst / "Orgn of Scientific Compg Installations" in "Computers and Automation"

Carr, George J / Mgr, Thermodynamics & Performance Compns, . . . / AMP / '32, Villa Madonna Coll; Univ of Cincinnati, '55, mathn

Clarks, Dorothea S / Automatic Coding Analyst, . . . / Systems & Automatic Coding Devt / '21, Hiram College, '53 —

Cruickshank, Robert D / statl analyst, . . . / AM / '31, AB, Oberlin College, '57, mathn, statn

Donovan, David P / Mgr Compns Facilities, . . . / BP / '24, Univ of Cincinnati, —

Earner, George E / Thermodynamics Compns Analyst, . . . / LMP / '30, Miami Univ, Oxford, Ohio, '58 — / MA Thesis on "Applications of the Fields of Integers, Modulo P, to the Fermat Problem"

Entzminger, Thomas A / Thermodynamics Compns Analyst, . . . / LMP / '26, Va State Coll '57 —

Erickson, Daryth Y / Prgmr, . . . / AMP / '36, Colo Coll, '56, prgmr

Hahn, Donald J / Thermodynamic Compns Specialist, . . . AMP / '31, Univ of Cincinnati, '54, —

Holt, Roy Vincent / Engrg Systems Compns Analyst, . . . / AM / '26, Ohio State Univ, '52, mathl analyst

Hunter, William Heber / Automatic Test Data Procg Analyst, . . . / ALMP / '35, Ohio Univ, '58 —

Kuzirian, James H / Automatic Test Data Procg Analyst, . . . / AP, test and tech data procg / '33, Wayne State Univ, '57 —

Marlette, Lora Lee / Prgmr, . . . / AMP / '32, Hanover Coll, Xavier Univ, '58, prgmr

Robertson, Yancey V / Prgmr, . . . / AMP / '34, Georgetown Coll, '55, prgmr

Schatz, Vernon L / Mgr, Bus Systems Aplns, . . . / AB / '21, Iowa State Coll, '57, engrg / Registered Engr, Ohio Member SAE

Schneider, Martha May / Numerical Analyst, . . . / MP / '34, Univ of Ky, '56, numerical analyst

WHO'S WHO IN THE COMPUTER FIELD

Each year we like to bring up to date our "Who's Who in the Computer Field." We are currently asking all computer people to fill in the following Who's Who Entry Form and send it to us for their free listing in the Who's Who that we publish from time to time in **Computers and Automation.** We are often asked questions about computer people, and if we have up to date information in our file, we can answer those questions.

If you are interested in the computer field, please fill in and send us the following Who's Who Entry Form (to avoid tearing the magazine, the form may be copied on any piece of paper).

Name? (please print) ....

Your Address? ....

Your Organization? ....

Its Address? ....

Your Title? ....

Your Main Computer Interests?

( ) Applications
( ) Business
( ) Construction
( ) Design
( ) Electronics
( ) Logic
( ) Mathematics
( ) Programming
( ) Sales
( ) Other (specify):

....

....

Year of birth? ....

College or last school? ....

Year entered the computer field? ....

Occupation? ....

Anything else? (publications, distinctions, etc.) ....

....

....

....

....

....

....

....

When you have filled in this entry form please send it to: **Who's Who Editor, Computers and Automation,** 815 Washington Street, Newtonville 60, Mass.

MANUSCRIPTS

WE ARE interested in articles, pers, reference information, and scussion relating to computers and tomation. To be considered for y particular issue, the manuscript ould be in our hands by the first f the preceding month.

RTICLES: We desire to publish articles at are factual, useful, understandable, and teresting to many kinds of people engaged one part or another of the field of comters and automation. In this audience are any people who have expert knowledge of me part of the field, but who are laymen other parts of it.

Consequently, a writer should seek to exain his subject, and show its context and nificance. He should define unfamiliar rms, or use them in a way that makes their eaning unmistakable. He should identify familiar persons with a few words. He ould use examples, details, comparisons, alogies, etc., whenever they may help aders to understand a difficult point. He ould give data supporting his argument d evidence for his assertions.

We look particularly for articles that plore ideas in the field of computers and tomation, and their applications and imications. An article may certainly be conoversial if the subject is discussed reason bly. Ordinarily, the length should be 1000 3000 words. A suggestion for an article ould be submitted to us before too much ork is done.

ECHNICAL PAPERS: Many of the foreing requirements for articles do not necesily apply to technical papers. Undefined hnical terms, unfamiliar assumptions, athematics, circuit diagrams, etc., may be tirely appropriate. Topics interesting obably to only a few people are acceptle.

EFERENCE INFORMATION: We desire to int or reprint reference information: lists, sters, abstracts, bibliographies, etc., of use computer people. We are interested in aking arrangements for systematic publition from time to time of such informan, with other people besides our own ff. Anyone who would like to take the sponsibility for a type of reference infortion should write us.

EWS AND DISCUSSION: We desire to print ews, brief discussions, arguments, anouncements, letters, etc., anything, in fact, it is not advertising and is likely to be f substantial interest to computer people.

AYMENTS: In many cases, we make small ken payments for articles and papers, if e author wishes to be paid. The rate is dinarily ½c a word, the maximum is $15, d both depend on length in words. hether printed before, whether article or per, etc.

All suggestions, manuscripts, and inquirs about editorial material should be adessed to: *The Editor,* COMPUTERS *and* UTOMATION, *815 Washington Street, ewtonville 60, Mass.*

Stephens, Garnett L / Mathl Compns Analyst, . . . / ALMP / '31, Univ of Ky, '56, mathn

Toth, Fred C / Prgmr, . . . / ABLMP / '34, Univ of Cincinnati, '57 —

Trenkamp, Paul J / Engine Performance Compns Analyst, . . . / LMP / '35, Villa Madonna College, '55 —

Tumbusch, James J / Specialist, Statl Aplns, . . . / AM / '29, Univ of Dayton, Purdue Univ, '56, statn

Vollenweider, Mrs. Deborah B / Reactor Compns Analyst, . . . / LMP / '33, Wellesley Coll, Univ of Cincinnati, '55 —

Watson, Doneley H / Mechanics Compns Analyst, . . . / AMP, astronomy / '29, Omaha Univ, Indiana Univ, Univ of Cincinnati, '55, mathl analyst / Cincinnati Engrg Society, many pubns on prgmg, etc.

Watson, Flora J / Part-Time Compr Prgmr, . . . / MP, astronomy / '28, Hunter College, Indiana Univ, '50, analysis prgmg / Sigma-Xi

Williams, Gregory P / Compr Aplcns Specialist, . . . / AMP, stat / '26, Columbia Coll, '54 —

Woldstad, Carole / Numerical Analyst, . . . / P / '34, Univ of Mich, '57, mathn

U. S. Navy, Electronic Supply Office, Building 3500, Great Lakes, Ill.

Adams, Alexander / Program Branch Head . . . / PO / '21, Newark Coll, Univ of Ala, '56, compr prgmg

Alexander, Clarence O / Supt Compr Prgmr . . . / ABLPO / '27, Met Sch of Music, '56, Syst Analyst, prgmg

Clark, Betty J / Compr Prgmr, . . . / P / '24, Ohio State Univ, Wilberforce Univ, '57, prgmr

Copeland, James L / Compr Prgmr . . . / LP / '32, Lake Forest Coll, '56, prgmr

Hayes, Lucy A / Compr Prgmr . . . / P / '24, Univ of Wyo, 56, prgmr

Johnson, June M / Compr Prgmr . . . / — / '27, Wright Jr Coll, '56, prgmr

Keddie, Clifford M / —, . . . / ABLMPS / '25, Western Mich Univ, '56, prgmr-analyst

Kollman, Robert C / compr prgmr . . . / ACDELP / '24, —, '57, prgmr

Kula, Walter A / compr prgmr . . . / ALP / '26, —, '57, prgmr

Leszko, Nick J / Supervisory Compr Prgmr . . . / ABELP / '28, Lane Tech, '56, prgmr

Lillehamer, Arne M, Jr. / Compr Prgmr . . . / ABLMP / '29, Wisc State Teacher's Coll, '57, prgmr

Matoushek, Edith / Compr Prgmr, Integrated Data Procg Div . . . / BP / '22, Univ of Chi, '55, prgmr

Niemann, Clifford R / Asst Dir, Integrated Data Proc Div . . . / AB / '18, Univ of Chicago, '55, systems devt analyst

Olmer, Jane / Staff Mathn, . . . / BMP / '12, Wellesley Coll, Sorbonne, Ecole libre des Sciences Politiques, Wash Univ, '56, Mathn, Res Prgmr / Phi Beta Kappa, Sigma Xi, Pi Mu Epsilon

Paul, John William / Compr Prgmr, . . . / GMP / '26, Cath Univ of Amer, '56, economist, prgmr

Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio

Belzer, Jack / Consultant, . . . / ABLMP / '10, Cooper Union, '40, engr-mathn / Publns: many articles on Computer Applications, including Astronomy, Thermodynamics, Mathematics, Engineering; also various tables in book form

Boyd, Roger S / Princ Physicist, . . . / AL, nuclear-reactor simulation / '31, Ohio State Univ, '56, physicist / licensed to operate Battelle Research Reactor

Fletcher, B L / Princ Physicist, . . . / AP / '22, Ohio State Univ, '56, physicist

Gordon, Ben / Proj Leader, . . . / ADE, pertaining to analog comprs / '26, Ohio State Univ, '55, electl engr

Hulbert, Lewis E / Princ Mathn, . . . / MP / '24, Ohio State Univ, '52, mathn

Jenkinson, George H / Proj Leader, . . . / ADEL / '21, Marshall Coll, '47, engr / publn "Communicating with Computers"

King, Rolland D / Proj Leader, . . . / CDEL / '29, Otterbein Coll, '54, proj leader in systems engrg

Kuhn, George R / Princ Mathn, . . . / AMP / '32, Ohio State Univ, St. Louis Univ, '56, mathn

Nealeigh, Thomas R / Princ Mathn, . . . / AMP / '25, Ohio State Univ, '55, mathn

Pritsker, A. Alan B. / Proj Leader, . . . / ABLM / '33, Columbia Univ, Ohio State Univ, '55, engr — both electl and indusl publns: "Evaluation of Microfilm as a Method of Book Storage," "Simulation to Obtain a Systems Measure of an Air Duel Environment"

Smith, Richard L / Princ Engr, . . . / ALMP / '33, Ohio State Univ, '52, indus engr

Solomon, Josef G / Princ Mathn, . . . / ALMP / '31, Ohio State Univ, '56, mathn-physicist

Weissberg, Alfred / Princ Mathn, . . M / '28, Univ of N.H., '57, mathn

Wetherbee, John K / Div Chief, . . ACD / '26, Ohio State Univ, '50, el engr

ADVERTISING INDEX

Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisement appears / name of agency if any.

ime
luct
cuit

OUTPUT
N°2

N645
60
30
20
5

-5

t 2, Mich.

t Plaza

CAL
OR